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November 1982
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Number 71

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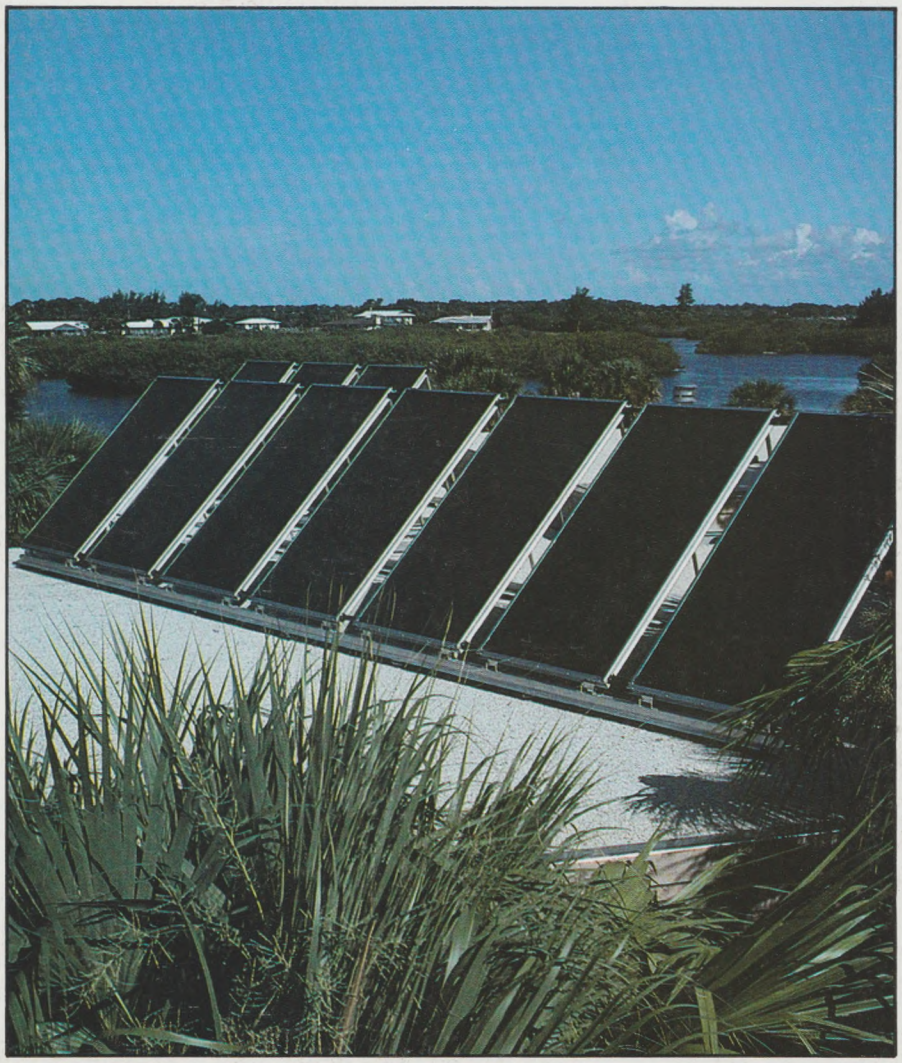

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PUBLISHER'S REMARKS

By Wayne Green

Grab Your Share Of Low-End Market

It's War!—And You Can Win!

Whenever there are big bucks being fought over, if you look carefully you can usually find a way to get part of the action. Look at what happened with the Radio Shack TRS-80 situation. Despite the Shack's every effort to keep news of the after-market for their computers a secret, a whole industry has sprung up around them, now selling software and add-ons to the tune of hundreds of millions of dollars. *80 Micro* readers alone report that they spent over $300 million last year.

A similar situation is building up around the low-end computer market, so let's see how this has developed so far, where it may be going and how you can take advantage of the situation. Microcomputers have already made a lot of new millionaires, and there will be many more coming along.

Now, to put this into perspective, let's remember that microcomputers got started back in 1975 with the Mits Altair computer, which was sold mostly in kit form. Mits had everything their way except an ability to see the long-range ramifications of what they were doing. The original idea was brilliant.

Then, when the first competition came along in the form of the Sphere computer, they panicked and tried to compete with the Sphere. The Altair was based on the 8080 chip and the Sphere on the 6800, so Mits rushed out a 6800 version of their computer, which, as far as I know, never worked very well. Of course, neither did the Sphere, which eventually blew away.

This little battle weakened Mits and forced them to accept a takeover by Pertec, then mainly a manufacturer of disk drives.

The first computers were sold by mail order and via orders taken by a factory sales team going around in a camper. Then the first computer store opened in mid-1975, and this quickly became the way to sell microcomputers. The one store in August 1975 grew to 50 in 1976 and 500 by August of 1977, when Radio Shack announced their TRS-80, which they sold from their over 5000 company-owned stores. They backed this with magazine advertising, plus television and newspaper ads, and sales zoomed upwards, quickly passing everyone else in the field.

With the coming of the low-end computers such as Atari 400, the Shack could see that if they were going to keep up with the microcomputer market they would have to cover the low end, the middle and the high end—hence the 1980 introductions of the TRS-80 Model III for the middle ground, the Model II for the high ground and the Color Computer (CoCo) for the low end.

> Today, low-end computers are developing into a huge market.

Today we see the low-end computers developing into a huge market, with the Atari 400, the TI 99/4A, the Commodore VIC-20 and Max, the Timex-1000 (Sinclair-ZX81) and the TRS-80 CoCo battling for outlets and advertising. This time, at least for the time being, it is Radio Shack which is taking the shellacking.

Though they now have about 6400 company-owned stores, plus perhaps 2500 independently-owned associated stores, they are finding themselves up against Atari and TI, who are rushing their computers into discount stores, department stores, and just about any consumer store which will give them counter space. Worse, by virtue of this massive distribution, Atari and TI have been able to cut their prices and put CoCo out of the running.

The dual nature of Radio Shack, which was their early strength, is now their weakness. If they are going to really compete in this developing home computer market they are going to have to sell the CoCo through thousands of non-Radio Shack outlets. If they do that they will obviously weaken their major marketing strength for selling middle- and high-range computers—as well as hurting their huge toy market. It's a no-win situation.

The Shack has been indecisive about this, which is understandable. They are tentatively releasing a special model of the CoCo through RCA distribution, testing the waters. But if they go all the way, getting the CoCo into tens of thousands of stores, and thus building up the production quantities which will allow them to lower prices to compete with Atari, TI and Commodore, they will be doing it at the expense of their own stores. And if they don't do this, obviously they are going to have to get out of the low-end business and forget the CoCo.

There is another, even better alternative, but I'm not crazy enough to put the best solution to their problem in print and just plain give it to 'em. I'm generous, but not fanatically.

With low-end computer systems being sold through tens of thousands of discount stores, we are going to have millions of families buying small computers, and this is going to be one hell of a market for software and add-on accessories. It seems reasonable to project a time in the near future when it is going to be very difficult to sell a dedicated game computer because for a very few bucks more a family will be able to buy a computer which can not only play the same games, but also will be usable for a wide range of other applications. Atari, Commodore, TI and Timex see this handwriting on the wall. Mattel must too, so we should be seeing a Mattel computer soon.

The situation for the entrepreneur is

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similar to the one the industry faced when Radio Shack made it clear that they wanted all the marbles as far as selling products through their stores was concerned. The TRS-80 support industry had to turn to *80 Micro* and sell the products to the TRS-80 owners via mail order. Computer stores not selling the TRS-80 systems, which was almost all of them, didn't want to carry products supporting a system they didn't sell, so the industry had no place to turn but to *80 Micro*. And turn they did, building the 132-page magazine of early 1980 to the over 500-pager of today—making many new millionaires in the process.

Again, it is not going to be practical to try and reach the home computer buyers through K-Mart to sell them software, added memories, printers, music keyboards, and so on. Only the billion-dollar firms can cope with the costs of selling through this type of distribution . . . and only the fastest selling products would be welcome anyway. These outfits have to move merchandise by the carload to stay in business. They have to be able to sell everything with untrained check-out clerks, not computer expert salespersons.

If you have your eye on making it big (and why not?—the pains of being rich are more than made up for by the comfort of money), perhaps now is the time to start laying the groundwork for taking advantage of this coming market. Remember that once people buy a new toy they start looking for gadgets to add to it. It is *fun* to buy gadgets. In this case we have a market which is going to need thousands of programs, lots of accessories, printers, charting systems, plotters, modems, controls for model trains, and so on. It is going to need computer covers, computer benches, computer cleaning kits, computer testing programs and hardware, and so on. The need will be there for disks of all kinds, voice recognition units, talking units, light shows. The list is endless.

You can get started with this by getting one of the systems and tackling the software development. You might pick out some of the best programs you've seen published in this magazine or in *80 Micro* and convert them to run on your new computer—the Atari 400, for example. I can assure you that any number of program publishers will be interested in talking with you, but in this case, since you're screwing around with software *we* have copyrighted, you'll want to discuss distribution via Instant Software, the only mass distribution firm who can use our copyrights. You will have to share your royalties to some extent with the original author of the program, obviously.

Next you may want to contact Instant Software (and other firms) about converting TRS-80 programs to run on your chosen low-end system. You'll have to do a good bit of work on the graphics, of course, but remember that the more work you do, the better will be the royalty percentages. Instant Software will, by the way, be experimenting with some trees of software in major discount houses, so the very best selling programs will have an opportunity to really make it big. Most programs will have to start out via mail order and build up a reputation before they can be risked for true massive distribution.

Hardware accessories should be designed to sell for as low a price as possible. It is unlikely that many customers will want to spend $500 for an add-on for a $200 computer, right? We may be able to get away with that for printers and plotters, but most gadgets should be aimed at the low end.

Since these $200 computers can do just about anything that the higher-end computers can do, the people buying them are going to have to turn to the magazines (such as this) to learn more. I think we'll be developing quite a big market via this route.

Mail order is a wonderful business. It is one which you can run from just about anywhere. Heck, the magazine business is mail order, so soon after starting in publishing I moved to where I felt was the best part of the whole country to live: New Hampshire. A whole publishing mecca has built up around me in the last 20 years, as was mentioned in the *Wall Street Journal* recently (9-2-82—a nice birthday present for me).

In mail order you can start with a minimum of expense and gradually build up your business, adding products as you grow. You're your own boss. Oh, there are a lot of things you have to learn to be a success in mail order. You have to learn about advertising, how to write ads and sell copy, how to get your products made, how to ship them, how to handle problems . . . and dishonest customers. You want to know about making up your catalogs, which means writing, typesetting, printing, handling list rentals and so on. You certainly want to computerize as much of the operation as you can, as soon as you can.

When you are depending on direct mail and mail order sales you must measure the sales you get from every ad as exactly as you can. You must have follow-up sales literature for prospective customers who write for more information or who send in reader's service cards to the magazines. The follow-up letters should be professionally done. This means that either you are going to learn to do it and be the professional or else shell out a lot of money to get a professional to do the writing.

Those are later worries. The first thing is to get started converting programs for the Timex, the Atari, VIC and TI, and maybe even a few for CoCo. And start looking at these systems and see what they need for expansions . . . perhaps a better keyboard or maybe an interface for an IBM 75 typewriter. □

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By Thomas V. Bonoma

One-Pagers For the PC

Three Useful Utilities

IBM has gone to great lengths to configure its Personal Computer, software and peripherals to its users' needs.

When the PC's Basic or BasicA (an advanced version of disk-based Basic which features enhanced graphics and sound commands) is brought up, the "function keys" (which are located to the left of the regular keyboard) are pre-configured for the user.

For example, pushing key F1 enters a List command into the computer, F2 runs the program in memory and F3 enters the Load command plus a double quote sign (") into the machine so that the operator has to enter only a file name to get a new program.

Additionally, the trouble the "baby blue" folks took to integrate their chosen peripherals into their system is obvious. Although an advanced user might quibble about the choice of an Epson 80 printer (the "IBM Personal Computer Printer" is an Epson with an IBM nameplate) as the right choice for serious word processing, it's hard to argue over how well the machine and its dot-matrix printer work.

One of the most convenient features is a "screen dump" key on the keypad. By pressing the "PrtSc" key, the operator can dump the text-only portions of any screen to the printer. Now that's thinking ahead!

Still, there isn't much software around for real work on the IBM, especially when utilities are of concern. And potential users are still trying to decide just *what* it is this baby IBM offers that should entice them to bury that H-89 or Apple in the closet, or bite the bullet on a new system, or take the plunge on their first.

What I'll do in this column is introduce potential users to just a few of the PC's advanced commands. At the same time, I'll give current users three utilities which have proven useful to me in everyday programming.

And, since only one of those three utilities is completely restricted to the PC and unadaptable to other machines, even you H-89 users or others with Epsons will find two printer routines you can use, one which will pretty up your listings and other output, and the other which is most useful in designing and printing forms for the Epson.

Three IBM One-Pagers

1. Program SOFTKEY.BAS

Listing 1 shows SOFTKEY.BAS, an IBM Basic (or BasicA) program which resets the PC's ten softkeys to better suit my programming needs. The program works on both the monochrome and color adapter boards for the PC.

The PC allows its owner to display text and limited graphics with a "monochrome," or single-color green-on-white display, or to add a 16K color graphics card which displays 16 different colors, independent background colors and even screen border colors in many formats. So it doesn't matter which you have.

Fig. 1 shows the output when the program is run. Let's step through the listing line-by-line, making sure to say a kind word about that professional-looking listing frame at the top of the program list.

Lines 10–30, of course, are comments, but I can't urge you too much to "waste" the space and write them in liberally in everything you do. I often don't get back to my machine for a week or more at a time, and when that happens, it's easy to forget just what that little routine I was so proud of was supposed to do.

Line 40 turns the CRT softkey display on. On the PC, the user has the option of displaying the function key labels on line 25 of the monochrome or color display. Line 25 does not scroll with the rest of the display but remains fixed in place.

Sometimes, of course, you don't want

```
F1  LIST
F2  RUN
F3  LOAD"
F4  SAVE"
F5  WIDTH 80
F6  WIDTH 40
F7  FILES "A:*.*
F8  FILES "B:*.*
F9  CLS
F10 SCREEN 0,0,0

Ok

                SOFT KEYS ARE SET

1LIST       2RUN        3LOAD"      4SAVE"      5WIDTH
6WIDTH      7FILES      8FILES      9CLS        0SCREEN
```

Fig. 1. Output from Listing 1.

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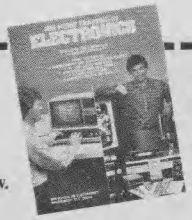

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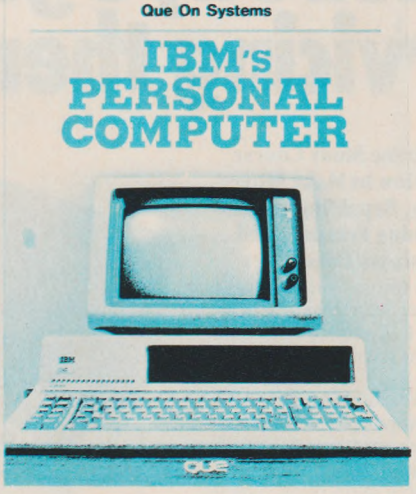

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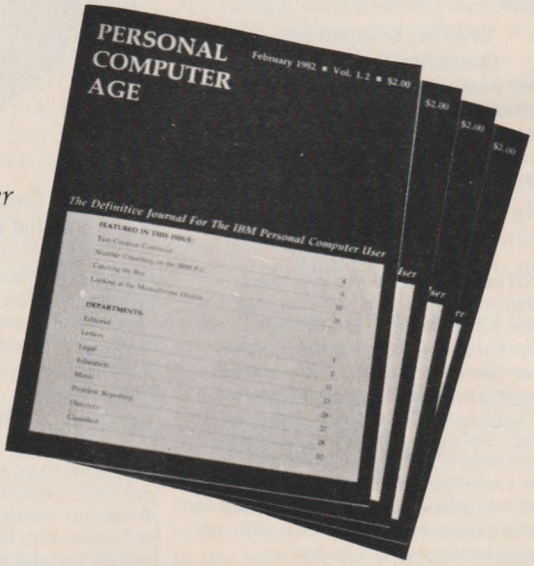

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such a line detracting from your beautiful graphics, or else you'd like to use it to display other messages (a good use is for input statements). But here, we'd like to have it on so we can see that the program is resetting the factory functions in the right way.

Lines 50–79 reset six of the keys to functions I find more useful in my system, which has two disks and a monochrome as well as a color adapter.

First (taking line 50 as an example which will explain the remaining resets as well), the Key n statement is one of four types of Key statements which can be used. Key On in line 40 is another; Key Off (to turn the function keys off) is legitimate as well.

> It wouldn't be any fun to program without fooling with PC's graphics/color capabilities.

Key List, which we'll see in line 95, prints the listing of the softkeys and the current functions on the screen. And, the Key n statements I'm using in lines 50–79 are used to define/redefine the softkeys.

For line 50, when F1 is pushed I've programmed the machine to switch to an 80-column screen width by causing the F1 key to enter Width 80 and Return when pressed (the PC has two selectable screen widths for text display—40 and 80 columns).

Two lines down, Key 6 will be redefined to switch the display to 40 columns, allowing the operator to switch back and forth at will.

Line 75 reprograms Key 2 from the PC's default Run plus Return command to display a Run plus a space. I frequently found that the program I wanted to run was not in the machine, but out on a disk somewhere. It was much easier for me to be able to push the F2 key and then enter B:Softkey than to have the computer madly start to run the program in memory for me again.

If there's anything I absolutely hate to type, and usually wind up typing all day, it's disk catalog requests. I never know what's on the disk, or whether the program I'm looking for is in drive A or B.

Conversely, though I occasionally use the PC's built-in TRON and TROFF (TRace ON and TRace OFF functions, which are debugging aids for Basic programs), I don't use them nearly as frequently as disk cataloging. For me, the PC people made a bad choice when they devoted two of the softkeys (F7 and F8) to these functions.

Therefore, it was the easiest thing in the world to replace F7 and F8 with the command to catalog drive A and B, respectively. Note that the CHR$(34) command at the beginning of each of these softkey assignments is merely a cheater's way to get a double quote (") into the softkey string. You can't type just one or the program will think that you're closing the assignment string and read the assignment as a null ("") string.

It wouldn't be any fun to do straight programming without fooling a bit with the PC's graphics/color capabilities. I was unable to write this utility without doing so.

Statement 85 turns off the softkey display (with the "old" values), changes the color on the monitor (if used; otherwise nothing happens in monochrome) to a light-blue text with a cyan background. It also turns the softkey display back on and sets the color of the display to white on black with no border (Color 7,0,0).

If you're using a monochrome adapter, you'll see the new softkey labels in high-intensity white and the numbers before the new labels underlined. If you're using a color adapter, you'll see the new labels in a pretty way.

Line 90 locates the cursor (like a PRINTAT in TRS-80) at CRT line 20, column 30, and prints the message "Soft keys are set." Line 95 sets the text color to green (on a color adapter—there's no effect on a monochrome one) and sets a red border around the screen (COLOR 2,0,4). It then relocates the cursor to row 1, column 1 of the screen and prints a line

```
    Time:  00:06:28                        Date:

                  I.B.M. ONE-PAGER:  PROGRAM SOFTKEY.BAS

                                by Thomas V. Bonoma

                  Sets the softkeys for BASIC programming.
```

```
10 REM           PROGRAM SOFTKEY.BAS
20 REM                   SETS THE SOFTKEYS FOR GENERAL DISK-BASED PROGRAMMING
30 REM                   THOMAS V. BONOMA
40 KEY ON
50 KEY 5, "WIDTH 80"+CHR$(13) 'ALLOWS USR TO GET 80 COL DISPLAY
60 KEY 9, "CLS"+CHR$(13) 'REPLACES KEY FX WITH HOME SCREEN ONE
70 KEY 6, "WIDTH 40" +CHR$(13) 'ALLOWS USR TO GET 40 COL DISPLAY
75 KEY 2, "RUN " 'REPLACES RUN WITH RETURN WITH RUN W/OUT RETURN TO ALLOW
                 DISK ACCESSES, ETC. BEFORE RUNNING
77 KEY 8, "FILES "+CHR$(34)+"B:*.*"+CHR$(13)
79 KEY 7, "FILES "+CHR$(34)+"A:*.*"+CHR$(13)
80 CLS
85 KEY OFF: COLOR 9,3,0:KEY ON: COLOR 7,0,0
90 LOCATE 20,30: PRINT "SOFT KEYS ARE SET"
95 COLOR 2,0,4:LOCATE 1,1:PRINT STRING$(25,240):PRINT:KEY LIST:PRINT:PRINT STRIN
G$(25,240):              COLOR 7,0,0
100 END
```

Listing 1. Program Softkey.BAS sets the softkeys for Basic programming on your IBM PC.

```
    Time:  10:15:04                        Date:  09-12-1982

                  I.B.M. ONE-PAGER:  Program TOPBOX.BAS

                                by Thomas V. Bonoma

          Puts a variable-sized box or border on the printed page.
```

```
100 REM  Print a Box on the Epson/IBM Printer
110 CLS:  INPUT "How wide should the box be, or enter 0,0 for defaults of 1,75)"
;START, FINIS
115 IF START=0 AND FINIS=0 THEN START=1:FINIS=75:GOTO 200
120 IF START<1 THEN 110
130 IF FINIS>79 THEN 110
140 IF FINIS<START THEN 110
150 START=INT(START):FINIS=INT(FINIS)
200 LPRINT TAB(START);STRING$(FINIS-START,&HAC);
300 LPRINT ""
400 CLS: INPUT "How much of the page to box (1=All;2=1/2 page;3=1/3 page;4=top b
ox;5=4 lines;              6 = check box)  ";HOWMUCH
500 IF HOWMUCH<1 OR HOWMUCH>6 THEN 400
600 HOWMUCH=INT(HOWMUCH):IF HOWMUCH=4 THEN HOWMUCH=7
610 IF HOWMUCH=6 THEN HOWMUCH=15
620 IF HOWMUCH=5 THEN HOWMUCH=12
700 FOR I=1 TO INT((66/HOWMUCH)-3):LPRINT TAB(START);CHR$(&HB5);SPC(FINIS-START-
1);CHR$(&HB5):NEXT I
800 LPRINT TAB(START);STRING$(FINIS-START,&HAC);
900 LPRINT:LPRINT:END
```

Listing 2. Program Topbox.BAS puts a variable-sized box or border on the printed page.

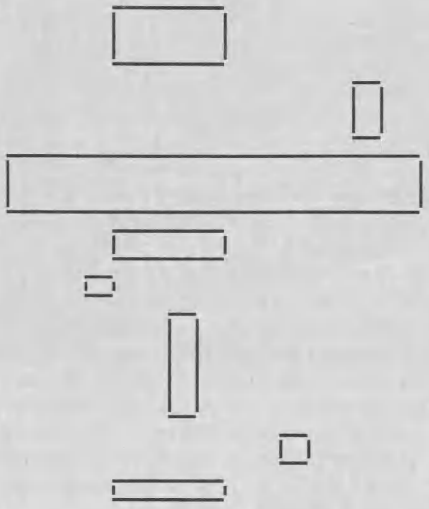

Fig. 2. Output from Listing 2.

of graphics characters using the STRING$ function (which says "25 characters of ASCII number 240," a three-bar equal sign at 25,240). Finally, it Key Lists the new softkey functions for the user before printing another string of graphics to border the listing.

Maybe you don't have two disks, or even one. If not, you might want to reassign F7 and F8 to better suit your own needs. For example, if you have a cassette tape but not a disk system, type these statements instead of lines 77 and 79 in Listing 1:

```
77 KEY 8, "MOTOR 0"
79 KEY 9, "MOTOR 1"
```

Now, when you hit F8, you'll turn on your cassette. Hit F7 and you turn it off. Or, if you spend all day opening and closing files outside of program control (why, I wouldn't know), you can use the softkeys for this as well.

2. Program TOPBOX.BAS

Listing 2 gives another IBM one-pager, called TOPBOX. That's really a misnomer, and more reflective of the program's origins than descriptive of everything that it can do.

The program, given an IBM PC and an IBM or Epson 80 printer, allows you almost total control over where and how big of a printed box you'd like on your paper. That might include a little check-box suitable for survey work, or an entire page-border that you can use to pretty up your word processing reports.

Let's look at this listing, which should be adaptable by all users (even without PC's printer) if you use an Epson printer.

```
Time:  10:44:50                    Date:  09-12-1982

              I.B.M. ONE-PAGER:  Program TITLIT.BAS

                          by Thomas V. Bonoma

        Puts up to three title lines on your printed output.
```

```
10 REM Print a Title In a Box - Up to Three Lines' Worth
20 GOSUB 2000 'This sets up what's to be printed...incl. time and date
22 FOR J=1 TO 75: LPRINT CHR$(&HAC);:NEXT J 'print a solid top line
25 LPRINT "" 'line feed
30 FOR I= 1 TO 7: LPRINT CHR$(&HB5);SPC(74);CHR$(&HB5)  'side line
31 IF TD THEN IF I=1 THEN LPRINT CHR$(&HB5);SPC(5);"Time:  ";TIME$;SPC(20);
     "Date:  ";DATE$;TAB(76);CHR$(&HB5):GOTO 35
32 IF COUNT=3 THEN IF (I>=3) OR (I<=5) THEN GOSUB 1000  'Three messages
34 IF COUNT =2 THEN IF (I=3) OR (I=5) THEN GOSUB 1000   'Two messages
35 IF COUNT=1 THEN IF (I=3) THEN GOSUB 1000             'One message
37  NEXT I
40  FOR K=1 TO 75:LPRINT CHR$(&HAC);:NEXT K             'Bottom solid line
50  LPRINT:LPRINT:END
1000 REM  Message Print Subroutine
1010 XCOUNT=XCOUNT+1    'a counter to see which one we're to print now...
1020 IF XCOUNT=1 THEN MSG$=FL$  'set msg$ to first line
1025 IF XCOUNT=2 THEN MSG$=SL$  'and to the second
1027 IF XCOUNT=3 THEN MSG$=TL$  'and to the third
1030 LPRINT CHR$(&HB5);SPC(75/2-(LEN(MSG$))/2);MSG$;TAB(76);CHR$(&HB5)
1040 I=I+1: RETURN 37    '1035 centers and puts side line on right and left
2000 'Message entry subroutine
2010 CLS:LOCATE 10,1: PRINT "You may enter up to three title lines, which will b
e printed centered in a box."
2015 PRINT
2020 PRINT "You may also choose to show the time and date."
2022 PRINT
2025 PRINT "Each title line must be less than 75 characters long."
2030 PRINT: INPUT "Show the time and date  ";YN$
2040 IF LEFT$(YN$,1)<>"Y" AND LEFT$(YN$,1)<>"y" AND LEFT$(YN$,1)<>"N" AND
     LEFT$(YN$,1)<>"n" THEN BEEP: GOTO 2030
2050 IF LEFT$(YN$,1)="y" OR LEFT$(YN$,1)="Y" THEN TD=1  'set time/date flag
2060 PRINT:LINE INPUT "First title line ";FL$
2065 IF LEN(FL$)>79 THEN BEEP:GOTO 2060
2070 PRINT:LINE INPUT "Second line (or return for none)  ";SL$
2075 IF LEN(SL$)>79 THEN BEEP: GOTO 2070
2080 PRINT:LINE INPUT "Third line (or return for none)  ";TL$
2082 IF LEN(TL$)>79 THEN BEEP: GOTO 2080
2085 COUNT=3
2090 IF SL$="" AND TL$="" THEN COUNT=1
2100 IF SL$="" OR TL$="" THEN COUNT=2
2105 IF FL$="" THEN CLS:GOTO 2010
2110 RETURN
```

Listing 3. Program TITLIT.BAS puts up to three title lines on your output.

Line 110 asks what margins the program should use for the box. If the user enters "0,0", default margins of 1 and 75 are invoked. Lines 115–140 are error-check lines, and you should never skimp on these!

In line 115, if the "0,0" response is detected, invoke the defaults and jump over the other error-checks to the print routine in line 200.

In line 120, make sure the user isn't trying to invent a new concept, the "negative margin."

In line 130, you'll need to adapt your box to the width of your paper, which is 80 columns. (Epson 100 users, or those who want to fool with condensed printing on the 80 for this program, can change this value to 132 columns since their machine/mode can handle them.)

Note that IBM Basic allows a variable name of any length to be employed, and it recognizes the first 40 characters of any name. So it's OK to use "CHARACTER032" and "CHARACTER033" as legitimate and useful names.

For those of you adapting this routine to other Microsoft Basic derivatives, you should check your manuals and possibly shorten my variable names to two characters (e.g., ST for START, FI for FINIS).

In line 140, you'll find one more test. If the user is especially creative and attempts to define a situation in which the right margin (end of the page) comes before the beginning, he may be awarded a degree in Zen philosophy but won't win any prize with this program.

In that and all the other error cases, the user is sent back to the input routine to get new values. A better way of doing this is to print a message describing each kind of error before going back to the input routine (but I'm lazy).

Line 200 starts the box-printing routine by tabbing to the start position and printing a string (STRING$) of FINIS minus start characters described by ASCII code &HAC.

In English, you're asking the machine to tab over to the left end of the box and print a character whose number we've looked up (it's just a fat dash—see Fig. 2) as hexadecimal (&H) number AC. (Let's see now . . . a C in hex is a 12, an A is a 10. How do I add those again? Oh yeah . . . 10 in the "16s" place is 160, and 12 in the "1s" place is 12. That must be 172.)

Note the semi-colon at the end of the line. We don't want any carriage return/line feeds until we're done with this business, which is what line 300 does.

Line 400 clears the screen (CLS), and asks the user how tall the box should be. Now, why would anybody with any kind of programming sense *start* the output, then *stop* it to get more information? I'll tell you what kind . . . the kind that likes to know things are working OK between the program and printer before wasting all his time entering data!

You're free to move line 400 up to around line 110 in the program—it

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won't make a bit of difference. But I like it where it is.

Anyway, line 400 gives the user six different choices for how big the box should be, from the whole page down to a little check-box suitable for printing at the end of surveys or sentences you'd like to have people check off.

Only one other of the choices is not obvious—top box. I often find it useful to put a blank box at the top of my program listings before I make them, so that I can later write in a running record of the changes I've made to the listing with my pencil, the date and what-not. This makes the job of revising programs marvelously easy.

Line 500 checks for the legitimacy of the input. Line 600 makes sure that the input is integer now if it wasn't before, and the second part of line 600 replaces HOWMUCH with a different number if choice 4 (top box) was made. You'll see why in a minute. Lines 610 and 620 supply similar replacements for choices 6 and 5 from the menu.

Why all that replacing? Look at line 700, which uses HOWMUCH itself to figure out how tall the box should be.

When HOWMUCH equals 1 (the whole page), 2 (half) or 3 (one-third), there's no problem because 66 (the form size of an 11-inch piece of paper) divides conveniently by these numbers. (The three subtracted from the result in line 700 is to give a little slop if your paper isn't exactly at the top of the perforation when you run the program.)

> Each of these routines can be useful either alone or incorporated into your own larger program.

When HOWMUCH equals 4 (top box), 5 or 6, it isn't so straightforward from the point of view of division, so we just replace these values of HOWMUCH with ones that will do the job. The user never needs to know.

The remainder of line 700 should be familiar to you by now. It tabs to start, prints a vertical bar (&HB5) and spaces over to FINIS minus start, minus 1. (The right margin should be at FINIS, minus the amount we used for the white space at the left of the box in START, minus the one vertical bar we've just printed.) Line 700 then sends another vertical bar to form the box until HOWMUCH is exceeded.

Line 800 closes the box in exactly the same manner as line 200. Line 900 sends two carriage return/linefeed commands to the Epson and ends the program.

Fig. 2 gives you some idea of the kinds of different boxes you can draw using this little routine and the Epson. The third box down on the page, for example, is a top box which would ordinarily be printed at the top of a printed listing. We will use the concept of a top box in the next utility to provide a labelling program for printed lists.

3. Program TITLIT.BAS

My last utility is a useful one which puts up to three title lines on your listings and on your other output—nicely boxed and set off from the listing.

The program also makes use of Basic and BasicA's time-of-day and date functions to put those on the title as well, if the user desires. The program is shown in Listing 3.

The output, which has been used for all three of my listings, is the top box on each of the listings and includes the date, time, program name, author's name and program function.

Line 20 in the listing sends the program to subroutine 2000, a useful little routine which allows message entry before the main print routine.

Line 2010 clears the screen (CLS), locates the cursor at row 10, column 1, and prints a message to the user concerning the number of lines he may enter for the title box. Lines 2020 and 2025 tell the user of his other options and constraints.

Line 2030 asks whether the time and

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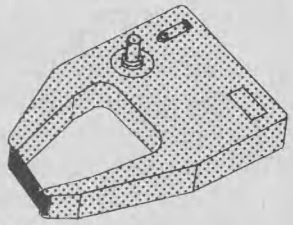

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date should be shown in the title box. Line 2040 checks to make sure that nothing other than a "y", "Y", "n" or "N" has been input, or else sends the user back to line 2030.

Line 2050 sets a flag, which is an arbitrary variable name set equal to 1, or true, if something has happened, and 0, or false, if something has not. The flag, named TD, is true if the user *has* asked for the time and date, and is checked in the main routine (Line 31).

Lines 2060–2082 allow the user to input up to three 79-character messages (even though the user is told he can only enter 75 above). Or they allow a Return to be entered to denote that no message is to be put on that particular line. FL$, SL$ and TL$ (first line, second line, third line) are assigned these messages, which can contain commas, quotes and any other things the user feels are necessary because of the use of the Line Input statements.

Error checking for length is done as the input is made, with verbose users being sent back to try it again.

Lines 2085–2100 set a variable, Count, to tell the main routine how many lines the user has entered. The program presumes that, if you're running this routine, you want *something* in the title box; so, if the first line is blank, it sends you back to line 2020 to try again. Line 2110 returns you to the main routine, which follows the one that called the subroutine (line 22).

Line 22 prints a 75-column fat dash across the screen (see Listing 2). Lines 25–30 are also identical to logic used in Program TOPBOX.BAS.

Line 31 checks flag TD to see if the Time and Date are to be printed. If so, the built-in PC functions of TIME$ and DATE$ are accessed and put up with formatted labels. Lines 32–35 check Count to see how many lines of output there are to go in the box, and send the program to subroutine 1000 (a message-print and centering subroutine) when the vertical spacing is right (I) for outputting neatly formatted text.

Line 37 closes the For loop started in line 30. Line 40 prints the bottom of the title box as a 75-column row of fat dashes before the program outputs two blank lines on the printer and ends at line 50. All that remains is to look at the heart of this program—the message output subroutine in line 1000.

Lines 1010–1027 use a new counter, Xcount, to assign the message variable, MSG$, with the relevant message (FL$, SL$, or TL$). Line 1030 is the heart of the subroutine, a centering line which prints the left vertical bar of the box, spaces one-half of the distance of the box width (75/2) minus one-half the length of the message (LEN(MSG$/2)) and prints the message centered in the box (remember high school typing class?). The final task in line 1030 is to print the right vertical bar on the line.

Finally, line 1040 increments the loop counter I (because we're replacing one of the statements in lines 30–37 with one in the subroutine, we need to account for this), and returns the program *not* to the next program line after the calling statements, as is normal with subroutine returns, but to line 37 with the optional IBM Basic statement return xxx. Those of you with other machines will have to do a little jockeying here with Gotos to get the logic right.

Each of the routines I've described here can be useful either standing alone or incorporated into your own larger program. To do that, renumber the programs with the PC's RENUM function (say, as RENUM 10, 20000, 10 to start the program on line 20000), and Chain Merge them into your own routines. If you are going to use the Chain Merge command in IBM Basic, however, remember to save my routines as ASCII files (e.g., SAVE "B:Softkey.Bas",A), rather than in the encoded format normally used by IBM Basic. Let me know what you do to generalize these routines or improve them, and feel free to incorporate them into your own programs. ■

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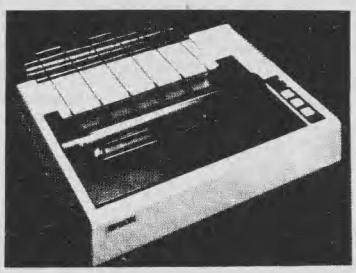

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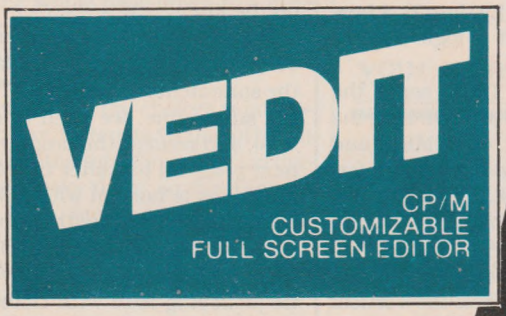

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By Robert W. Baker

Time Is Money

Collect Your Due With This PET Billing Program

Here's a simple little program with a number of possibilities and a few ideas that can easily be used elsewhere. (See program listing.) I wrote it so I could figure out how much I should charge for my consulting services with a local consulting firm. The firm would assign unique project numbers for every project they undertook and code them by project type. At the end of each month the firm wanted a bill for the time I spent on each project (at an agreed-upon rate) and any expenses that I incurred.

I normally carried a small calendar and simply jotted down my time and expenses each day. At the end of the month I'd have to go back through the calendar and add up the figures. It got to be kind of messy and time-consuming, so I wrote this quick little program to help out. It's not very fancy but it sure was handy then.

When you run the program it simply keeps asking for a project number and the number of hours spent on that project. So all I have to do is go through the calendar and enter each item in the order in which it's found. If an E is entered instead of a project number, then any general expenses not related to a particular project can be entered. Once a project number is entered, responding with E instead of the number of hours allows me to enter the expenses for that particular project.

When I'm done entering data, I enter a D for the project number. At that point the program asks if all projects are at the same hourly rate. Then the correct hourly rates for all projects or each individual project can be entered.

Once the program has all the necessary information, it sorts the projects into numerical order and computes the total for each project. The information displayed includes the project number, the total number of hours used, the hourly rate, the total expenses and the final total for that project. A separate line shows miscellaneous expenses not related to any particular project; a summary line showing combined totals is also displayed.

I never bothered to print out the totals since I was copying it onto special forms, but it could be done easily. Since I was displaying the final totals on the screen, I limited the program to accept only 15 different project numbers so it would fit on the screen. Again, you could easily change this by changing the DIM statement in line 90.

Looking inside the program, the A matrix records all project information as follows:

- A(__,1) = project number
- A(__,2) = number of hours
- A(__,3) = hourly rate
- A(__,4) = expenses

```
 10 REM **************************
 20 REM
 30 REM    SIMPLE TIME BILLING
 40 REM
 50 REM     BY: ROBERT BAKER
 60 REM
 70 REM **************************
 80 :
 90 CLR: DIM A(15,4)
100 PRINT"CONSULTING TIME BILLING"
110 PRINT"BY PROJECT NUMBERS, 15 PROJECTS MAXIMUM"
120 N=0: PRINT:INPUT"PROJ# (E=EXP,D=DONE)   ?";R$: IF R$="E" THEN 220
130 IF R$="D" GOTO 270
140 R=VAL(LEFT$(R$,4)): IF R=0 THEN 120
150 FOR I=1 TO A(0,1): IF A(I,1)=R THEN N=I
160 NEXT I:IF N>0 THEN 190
170 IF A(0,1)>14 THEN PRINT"TOO MANY PROJ #'S": GOTO 120
180 A(0,1)=A(0,1)+1: N=A(0,1): A(N,1)=R
190 INPUT"NUMBER OF HRS (E=EXP)   ?";H$: IF H$="E" THEN 220
200 H=INT(VAL(H$)*10+.5)/10: IF H=0 THEN 190
210 A(N,2)=A(N,2)+H: GOTO 120
220 IF N=0 THEN PRINT"MISC ";
230 IF N<>0 THEN PRINT"PROJ#";A(N,1);
240 INPUT"EXPENSES   ?";E$: IF E$="?" THEN 120
250 E=INT(VAL(E$)*100+.5)/100: IF E=0 THEN 220
260 A(N,4)=A(N,4)+E: GOTO 120
270 IF A(0,1)=0 THEN END
280 PRINT:INPUT"ALL PROJ'S AT SAME RATE (Y/N)   Y";R$: IF R$="Y" THEN 340
290 IF R$<>"N" GOTO 270
300 FOR N=1 TO A(0,1)
310 PRINT"$RATE/HR FOR PROJ#";A(N,1);"   ?";
320 INPUT R$: R=INT(VAL(R$)*100+.5)/100: IF R=0 THEN 310
330 A(N,3)=R: NEXT N: GOTO 370
340 INPUT"$RATE/HR FOR ALL PROJ'S   ?"; R$
350 R=INT(VAL(R$)*100+.5)/100: IF R=0 THEN 340
360 FOR N=1 TO A(0,1): A(N,3)=R: NEXT N
370 IF A(0,1)=1 THEN 440
380 FOR X=1 TO A(0,1): FOR Y=1 TO A(0,1)-1
390 IF A(Y,1) < A(Y+1,1) THEN 430
400 B1=A(Y,1): B2=A(Y,2): B3=A(Y,3): B4=A(Y,4)
410 A(Y,1)=A(Y+1,1): A(Y,2)=A(Y+1,2): A(Y,3)=A(Y+1,3): A(Y,4)=A(Y+1,4)
420 A(Y+1,1)=B1: A(Y+1,2)=B2: A(Y+1,3)=B3: A(Y+1,4)=B4
430 NEXT Y,X
440 PRINT"PROJ#  #HRS  $/HR  EXPENSES  TOTAL$": T=0: H=0: FOR N=1 TO A(0,1)
450 S=(INT(A(N,2)*A(N,3)*100+.5)/100)+A(N,4): T=T+S: H=H+A(N,2)
460 PRINT A(N,1);TAB(6);A(N,2);: P=14: V=A(N,3): GOSUB 530
470 PRINT TAB(19);"$";: V=A(N,4): P=23: GOSUB 530
480 PRINT TAB(29);"$";: V=S: P=34: GOSUB 530: PRINT: NEXT N
490 PRINT"MISC";TAB(19);"$";: V=A(0,4): P=23: GOSUB 530
500 PRINT TAB(29);"$";: P=34: GOSUB 530: PRINT: T=T+A(0,4)
510 PRINT"
520 PRINT"TOTAL";TAB(6);H;TAB(27);"$";: V=T: P=34: GOSUB 530: PRINT: END
530 D=INT(V): D$=STR$(D): D$=RIGHT$(D$,LEN(D$)-1): C%=((V-D)*100)+100
540 C$=RIGHT$(STR$(C%),2): PRINT TAB(P-LEN(D$));D$;".";C$;: RETURN
```

Program Listing. PET Simple Time Billing.

In addition, A(0,1) contains the number of different project numbers currently entered and A(0,4) contains the total general expenses.

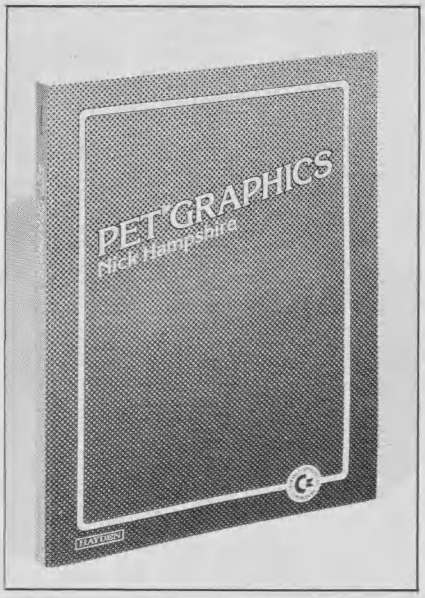
Lines 120–160 get the project number and check to see if it was previously entered by scanning the current matrix entries. When a new project number is entered, it's added at the end of the matrix in line 180. Lines 190–210 get the number of hours while 220–260 get expenses and add them to the current totals. Lines 280–360 get the hourly rate for all projects and lines 380–430 do a simple bubble sort to put the projects in numerical order. Lines 440–520 then print the totals as they're computed.

The subroutine in lines 530–540 is used to format numbers into dollars and cents. Note that hours are rounded to the nearest tenth (line 200) and expenses or rates are rounded to the nearest cent (lines 250, 320 and 350). When multiplying the hourly rate by the number of hours for each project, the total is also rounded to the nearest cent (line 450). These little checks help keep the final display from having odd values that destroy the expected table format.

As I said, the program is not fancy by any means, but it did help solve the problem at hand. I probably could have come up with better record-keeping methods but it was more fun to do it this way, playing with a new computer. If you're not doing consulting work, you can still use the main ideas for many other tasks (e.g. adding tax receipts, client billing or inventory control). You could use key words or names (text strings) instead of project numbers, or add more records per entry.

By showing you a simple problem and a primitive way in which I used a computer to help simplify that task, I hope I've encouraged you to try things on your own. Incorporate ideas or routines from different programs you see in magazines. Experiment and have fun, and don't be afraid to try an idea. If your first attempt fails, try something else; you'll learn as much from your mistakes as from your successes. (Sometimes even more!)

Circle 362 on Reader Service card.



This new book reveals some interesting graphics capabilities.

A new Hampshire book

Hayden Book Company (50 Essex St., Rochelle Park, N.J. 07662) offers a new book called *PET Graphics*, written by Nick Hampshire of England.

The book, which sells for $16.95, instructs PET users on how to program graphic displays. It includes machine-language subroutines which provide a wide range of otherwise unavailable graphic functions. They cover fine-resolution plotting, double-density plotting, multiple screen page displays and interfacing a light pen. Appendices include circuit diagrams of the PET video circuitry and the character codes used within the PET. All of the programs presented in the book are also available on disk from Hayden for $25 but the disk format isn't mentioned.

PET Graphics starts out with a description of how the video display works internally. It shows some simple graphic techniques in Basic and then quickly jumps into machine-language plotting and a presentation of the various machine-language routines included.

There are a few minor errors in logic here and there and quite a few typographical errors, but generally the book is well-written. The (one) major problem is that the machine-language routines are for Basic 3.0 and will not work on the current machines with Basic 4.0 ROMs. Since the machine-language routines make up a good percentage of the book, it will probably be of limited value to most PET/CBM owners. It's a shame Hayden didn't check it out further before going to print.

Another new book from England has surfaced in the States: *The PET Index*, published by the Gower Publishing Company Ltd. It's a reference index of Commodore PET/CBM/VIC information compiled by Michael A. F. Ryan from some 290 issues of 17 different publications between 1977 and mid-1981. More than 2100 references are listed, along with programs, reviews of books, equipment and programs, technical explanations and tips, applications of the PET, game listings and different languages.

The references are listed in alphabetical order by subject, which helps most of the time. Any updates or corrections that may have appeared in later columns or other articles are noted with the original entry. Each entry includes the article title and author, source, date of issue and page, main programming language, price, type of information available and other references.

The PET Index could be handy for libraries or clubs that have access to the magazines or publications listed in the reference. Bear in mind that it does list a few English newsletters and magazines that you may not have seen. Price of the book was listed in British pounds so I'm not sure what it will be selling for in the United States.

Misc

The PET Benelux Exchange is the only self-supporting and totally independent user's group for Commodore computers in Holland and Belgium. It was founded in 1979 by Copytronics and now has about 1500 members. They have an impressive user's library with more than 45 disks full of programs. They also print an excellent newsletter that's usually printed in Dutch but currently is offered in a special English edition.

The PBE ROM Special gives complete disassembly listings of the Basic 2.0 and 3.0 ROMs with full explanations of what is happening inside Basic. There are comments on almost every line of code with some block comments describing the following routines. There's also a cross-reference list of all the labels used and an index for both Basics.

Cost for single copies of this special edition sent by airmail is $20 in the U.S. while a 35 percent discount is available for user groups ordering ten or more copies. For more information, write Burg. van Suchtelenstraat 46, 7413 XP Deventer, Netherlands.□

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A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. $49.95/$15.

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This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. $99.95/$20.

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5" disks $99.95 (manual not included)
8" disks $99.95 (manual not included)
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C BASIC 2

Required for Osborne software. $99.95/$20.

SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text editor.
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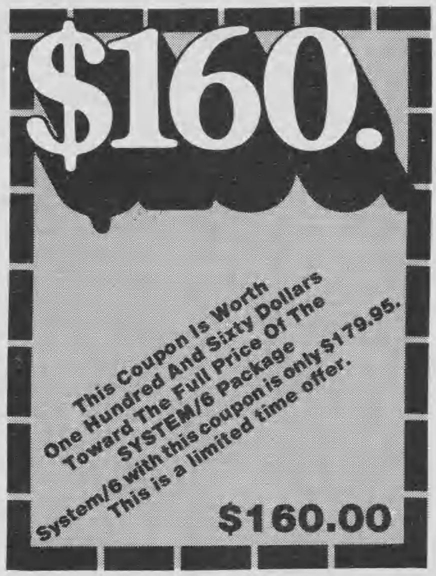

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Circle 18 on Reader Service card.

By Frank Derfler

Sizing Up New Technologies

Will Industry Peak Over Next Three Years?

Welcome to Dial-up Directory! We meet here each month to look at new and interesting products and developments in the field of microcomputers and telecommunications. This month, we will look at a new communications program for the Apple II released by the modem masters at Hayes Microcomputer products. We also will review a nice terminal program for the Atari computers. But first, a hard look into my crystal ball, and then—a contest!

The Future

I am occasionally allowed to prognosticate and philosophize in this column. This month, I am simply going to tell you how to become comfortably rich in five years. It doesn't have much to do with communications, so if you are already comfortably rich, please proceed to the software reviews.

First, the bad news: The personal computer sales boom is dying. It has a lot of life left and 1983 will probably be the best year yet, but it will also be the best year that ever will be for personal computers. If you are making a living out of microcomputers, limit your long-term overhead and watch your expansion plans. The market has a definite saturation point and it will be reached in '84 or '85. When K Mart starts mass marketing micros, how much longer do you think you will have a unique market?

In 1985, the go-go expansion will be gone and the sales of personal computers will have reached a steady level. What will you do? That's the good news.

A lot of things are coming together. My list of technologies to watch includes:

- Batteries and power supplies
- Sonar and optic sensors
- Very powerful microprocessors
- Cheap solid-state memories
- Small and inexpensive disk drives
- The Ada programming language
- Voice synthesis
- Voice recognition

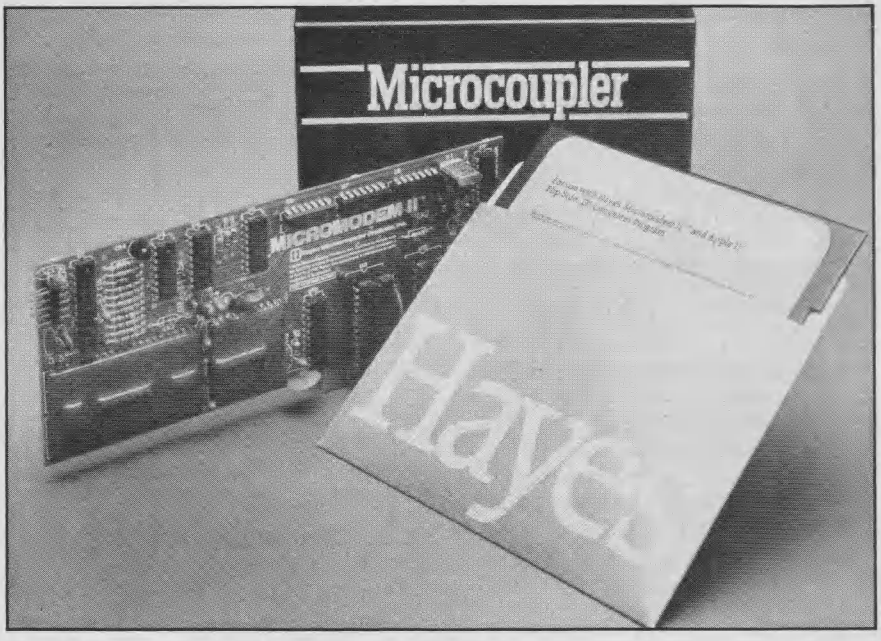
These technologies or developments all are improving or becoming practical at the same time. When I throw all of these things into a pot, stir them up, and boil them for a while, one big product floats to the top: robots. I don't necessarily mean human-looking devices, but I do mean human-working devices.

Robots (like computers) do dull and repetitive jobs well. As the power supplies, processors, sensors and storage capabilities of these systems improve, they will be able to do more and different jobs well.

Some of the robot jobs I can think of include: housecleaning, office "go-fer," security patrol, care of invalids and lawn mowing. Each of these jobs has numerous variations. Your job is to find the Apple II and VisiCalc of robotics. You have to find the single combination of hardware and application that would be able to sell tens of thousands of systems, lead to many other uses and create a whole new industry.

You can prepare yourself right now. We are at the same stage in robot systems that we were in 1972 with microcomputers. We all still are playing with S100 four-function calculators. Some big companies are marketing expensive and cumbersome devices for industry, but the practical systems are just ideas in someone's head. You will have to gather together a knowledge of the technologies I listed above, add them to some others and produce the first Altair.

If you want to be comfortable five years from now, I suggest you learn the



The Hayes Terminal Program for the Apple II and Micromodem II is the first in a family of programs for different computer systems. The software isn't fancy, but it provides all of the needed basic functions, including three methods of file transfer and control over the throughput speed.

Address correspondence to Frank J. Derfler, PO Box 691, Herndon, VA 22070.

TEST-FLY A $20 MILLION JET ON AN APPLE? YES. WITH MICROSPEED.

At the Bethesda Naval Research Center, they've discovered the power of MicroSPEED. The Navy's engineers use this remarkable hardware/software combination to "fly" an advanced fighter aircraft in *real time*—even making vertical landings on a simulated carrier deck. A "crash" is merely another learning experience, and an opportunity to modify the research aircraft—inside the Apple—to improve tomorrow's combat planes.
Surprised that such a sophisticated task is possible on the Apple? So were the Navy's officials, and many others who have discovered...

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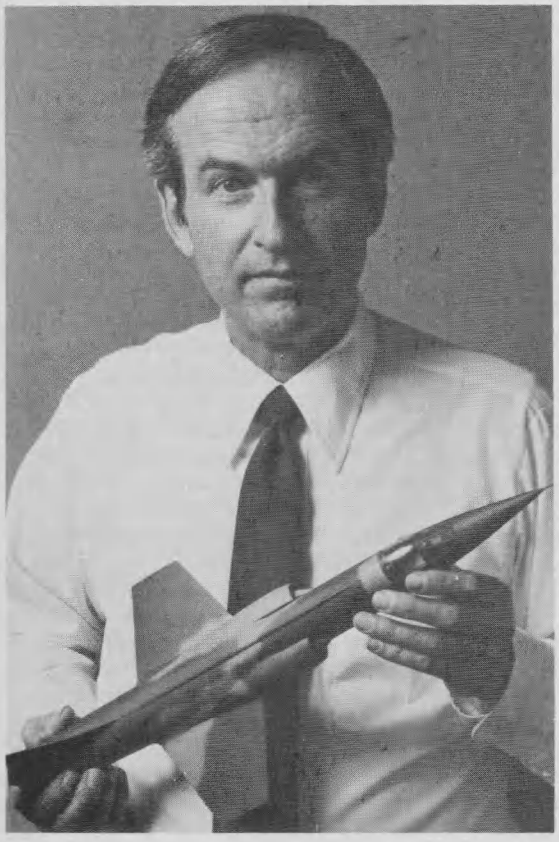

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Ada programming language and take a pass at Forth. You should learn all you can about sensor technology and voice synthesis and recognition. You should probably get a liberal dose of old-fashioned ac and dc electrical theory, too. The people who start the next industry will need a different blend of skills from those being taught in the standard engineering curricula. They will also need some good sense of what will sell. The door is wide open.

Over the next three years, personal computer sales will peak and flatten out. Information technology will become a game played between the giants of AT&T, IBM, the separate telephone operating companies, and the alternative carriers. The entrepreneur will be a minor player. Robots, however, will remain open to individuals. The Japanese, General Motors and IBM have leads in the area of robot devices for manufacturing, but you can move into many other application areas if you have the foresight.

When you think you have the VisiCalc of robotics, drop me a line—I want to invest. We now return you to our regularly scheduled program.

Have You Chronographed Lately?

Hayes Microcomputer Products put its Chronograph on the production line a little over a year ago. Since that time the company has sold many of these clock/calendar devices.

The Chronograph contains an RS-232C port and can respond to a request for the time or date or send a message over the serial line to the computer at a preset time. It has battery backup and several other automatic features.

I have a question for you Chronograph owners and a prize for the best answers. The question is simple: What do you do with your Hayes Chronograph? I know it makes a nice digital clock, but at a list price of $249, you have to do more with it than use it as a room clock. Tell me how you use your Chronograph.

Do you really have to have two RS-232C ports, or have you figured out how to put the clock and modem together into one port? What kinds of applications programs have you developed? How have you integrated the Chronograph's capabilities into your programs? The uses you describe don't have to be for communications. I don't care if you use the Chronograph and computer to open your garage door when you come home from work, but tell me what you do with it.

The most practical and creative applications will be rewarded with an autographed copy of either one of my books, *Microcomputer Data Communication Systems* or *TRS-80 Data Communication Systems* (your choice), and the thrill of having your creativity inscribed indelibly here in the pages of *Microcomputing*. Send a letter describing how you use a Hayes Chronograph to me at PO Box 691, Herndon, VA 22070. Your applications should be real and practical, not simply nice ideas. Include any programs or technical descriptions you care to send. I will be the sole judge, and the only person who is ineligible for this contest is my wife.

With the Utilities

I have often compared the contest between the two major consumer information utilities, Source and CompuServe, as a race between two swimmers in a pool. Source has a wild stroke, but they are flashy. CompuServe has a steady pace, but they are less innovative. Keeping with that analogy, Source recently attempted to change strokes and managed to run into the wall in the process.

The Source has run into a wall. Their mail system is so full of bugs that it's unusable.

In August, the Source sent out several things in the mail to their 20,000 subscribers. One was a very well done revision of the Source User's Manual. If you didn't get it, you should check on it. The second item was a notification of a rate increase. Their 300-baud service has gone up to $7.75 an hour during the most commonly used weekend and evening period. The third item was a description of their new mail system. It wasn't made perfectly clear, but the change in the mail system seems to be linked to a move into their own computers in Virginia from the leased systems they have been using in Maryland.

As this is being written at the end of August, the Source has run into a wall. Their mail system is so full of bugs that it's unusable. The slow response time of the system is made all the more painful by the knowledge that you are paying more per minute for the privilege of watching a blinking cursor.

I consider myself to be a professional in the area of software implementation and software transition on mainframe systems. If I gave the quality of service to the customers I support that we are receiving from the Source, I would expect to be fired. I hope I am judging them too harshly and perhaps they will recover when they complete the actual move in September, but so far, their transition plan is a cement block causing them to sink to the bottom of the pool.

In the other lane, CompuServe isn't totally perfect. They still have not fielded a friendly electronic mail system. But their E-Mail does do everything they say it will and if you read the instructions in the magazines and manuals, take lots of notes and practice, you can make it work nicely and quickly. In all other areas, they just keep on stroking. If you are a pilot and have an RNAV-equipped airplane, you should check out their new Great Circle Route flight planning program. It's a very practical time saver!

Attention, Atari

Atari users, your time has finally come. I have received a very good smart terminal program for the Atari 800 and 400 systems. The name of this program is T.H.E. Smart Terminal. It is distributed by Binary Computer Software, 3237 Woodward Avenue, Berkley, MI 48072. At $49.95, this program is reasonably priced.

T.H.E. Smart Terminal comes on either tape or disk. It has powerful disk commands, but it also allows tape users to capture received data and save it on tape. Tape users can create and save customized configurations of the program to work with various message systems or information utilities.

The minimum system needed to run this software includes an Atari 800 or 400 with 16K of memory (the more memory, the bigger the buffers), a cassette recorder or disk drive, the Atari 850 interface and a modem. The program will send commands to a Hayes Smartmodem, but it will not control the DTR signaling lines needed to use an autodial modem such as the Atari version of the Microconnection.

T.H.E. Smart Terminal maintains separate input and output buffers. The contents of a file recorded on a disk or cassette can be stored in an output buffer until you are ready to send it out to the system on the other end of the line. The output buffer could be used for long messages or for short blocks of characters such as auto-dialing instructions for a smart modem or a sign-on sequence for an information utility. While the computer is holding the output data, it can save incoming data into a separate buffer. The input buffer can be written out to tape or disk at your convenience or when it becomes full.

The author of this software package did not provide any capability for prompted transmission of the stored data. It is transmitted in a solid stream. You can pause transmission by returning to the main menu, but this is an awkward way to regulate the data flow. This kind of data dump without any pause or throttling can overload some

message systems and transmission utilities. The program could be significantly improved in this area.

T.H.E. Smart Terminal makes good use of the capabilities of the Atari systems. The special-purpose start, select and option buttons are used to call the menu, send data and enter a command without going to the menu. The program informs you it is saving the displayed data by presenting it in reverse video. It wraps lines that are too wide for the screen, but does so by breaking words instead of wrapping at a space.

The program has a unique method of selecting the various transmission options such as baud rate, word length and parity. The options are each assigned a numeric value on a menu. You add up the value of the options you want and enter the total at the bottom of the menu. Since each combination has a unique value and there are only a few valid combinations, the jobs of both the programmer and user are made much simpler.

T.H.E. Smart Terminal isn't up to the level of Omniterm for the TRS-80 or the ASCII Express for the Apple II, but it doesn't cost as much either. It represents a good value for the Atari user wanting smart terminal communications software at a reasonable price.

Hayes Communications Software

Hayes Microcomputer Products apparently has decided to round out its communications line by offering programs to interface Hayes' modems with various computers. The first program HMP has released is the Hayes Terminal Program integrating the Apple II and the Micromodem II. Other software is expected to follow for CP/M and MS DOS (PC DOS) machines and the Smartmodem devices.

The Hayes Terminal Program is a solid, no-frills, smart terminal package. It allows full control over the modem commands (built into the Micromodem II firmware) directing the modem to originate a call, answer a call and hang up the line. It also provides for saving incoming captured data in disk files.

The Hayes program provides a good degree of throttling of the data throughput. Throttling is a method of inserting a finite amount of time between each transmitted character. This reduces the overall efficiency of the transmission, but it is needed on certain data carriers and overloaded computers not able to take a continuous full-speed data dump. Throttling is a necessary part of a serious file transmission program.

The Hayes Terminal Program provides three different ways of transmitting disk files. File data can be transmitted using a start/stop, line prompt or error detection protocol. The start/stop protocol can be used for a straight data dump (with throttling) or for systems using CTRL-S and CTRL-Q to stop and restart the data stream. These codes are standard in the industry, but they can be redefined in the program if you run into a system using a different set of signals to control the data flow.

The line prompt mode is valuable for transmitting to a system like an ABBS that has to pack strings or do disk or I/O work at the end of each transmitted line. These systems usually send a specific prompt when they want the next line to be transmitted. They want your system to wait until the prompt is sent. Data transmitted before the prompt probably will be lost. Some programs handle this kind of transmission with a simple wait loop at the end of each line, but the better programs actually allow you to define the character they should look for before transmitting the next line. The Hayes terminal package is one of those good ones allowing definition of the prompt.

Finally, you can select a protocol file transfer mode. This mode can only be used with another Hayes Terminal Program at the other end. The programs at each end calculate a numeric value for each 1024 byte block of data as it is transmitted. If the values don't match, the block is retransmitted. This kind of protocol file transfer is very reliable. When Hayes releases the program packages for the other computer systems, the protocol file transfer will provide a good way to move files from one kind of machine to another.

The Hayes Terminal Program is menu-driven and easy to use. The number of menus is limited to what is practical and they do not form a maze for the user to work through, as some other menu-driven programs do. The program will work with the common 80-column display cards for the Apple II. It will also provide translation of keyboard characters so you can generate the characters Apple didn't put on the keyboard, such as the right and left brackets needed by many file systems.

This program for the Apple II is unique in that it will operate under Apple DOS 3.3, Pascal or CP/M. The distribution disk contains a routine able to boot up the computer and install the program on a disk properly formatted for the operating system in use. Installation is simple and fast and you can change the program to fit all of your operating environments.

The Hayes Terminal Program lacks the telephone number lists, macro command tables and fancy bells and whistles found on other communications programs. Users can write programs in Basic to add the desired operational luxuries to the sturdy structure Hayes has provided.

The Hayes Terminal Program is available either with the Micromodem II or as a separate package. See it at your computer dealer or contact Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092, for more information.□

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LETTERS TO THE EDITOR

Atari Owners, Stop Rejoicing

I'm sorry to disappoint Michael Reichmann, (*Microcomputing*, August, "Atari Owners Rejoice," p. 23) but his Atari computer with Atari Microsoft Basic is not five times faster than the IBM PC, nor is it nine times faster than the Apple II. I believe, in fact, that it is a bit slower than both of these computers. The problem with his timing comparisons stems from the meaning of the RND(X) function in Atari Microsoft Basic (AMB), which differs from that of the Apple II and (I assume) the IBM PC.

In AMB, this function delivers a random number between one and X, which in Mr. Reichmann's program was a one. In other words, every number in his array was the same because RND(1)*NN always evaluates to be NN.

This means that the list started out in a sorted order and required only one pass through to verify this. My Apple performs this same trivial sort in 42 seconds, about 12 percent faster than Mr. Reichmann's Atari using AMB. To get a more valid speed comparison using AMB, the RND term should be something like RND(NN).

Furthermore, using RND functions to generate the list to be sorted is not the best idea when making speed comparisons. I can get up to a 20 percent timing difference on my Apple II just because of the difference in the random array elements used. It is more conclusive to compare computers using the same set of elements. To this end, I changed line 70 to be 70 A(I) = I. With this revision, my Apple sorted 500 numbers in 42 seconds. This is the trivial condition in which all the numbers are already in sorted order.

Then I changed line 70 to be 70 A(I) = NN – I. This totally out of order 500 number list was sorted in 105 seconds. Finally, I changed line 70 to be 70 A(I) = I*((–1)^I) to alternate the sign of each element in the list.

This last list of 500 numbers was sorted in 315 seconds on my Apple II. I suggest that your readers use these three specific conditions to compare their own computers with the Apple. The program used should be as identical as possible to that listed on page 23 of the August issue of *Microcomputing*.

Atari Microsoft Basic really is a fine product. The number of major computers using some form of Microsoft Basic is testimony to this fact. However, sometimes it's tricky to compare one computer to another.

Craig Peterson
Santa Monica, CA

Reply:

Mr. Peterson's response to my letter in the August 1982 issue of *Microcomputing* is correct in pointing out that the speed discrepancy between the Apple and the Atari is not as great as indicated. My figures for the Apple were derived from a previous letter to the editor, not from independent verification.

Mr. Peterson points out that his Apple does the 500 number sort as listed in 42 seconds, but then proceeds to indicate that a more "conclusive" comparison would be to change line 70 to 70 A(I) = I. This also produces a run of 42 seconds. How is this "more conclusive"?

Though the RND function in AMB does indeed work as Mr. Peterson indicates, when line 70 is changed to his new form, the Atari also produces an identical run about 47 seconds.

Performing the other two variations proposed produces comparable times of 123 seconds and 371 seconds.

Michael H. Reichmann
Toronto, Canada

New Z-89 Skips a Step

Thank you for publishing the excellent article by Steve Howard, "Beat the High Cost of H88/89 Memory Expansion (August 1982, p. 80).

I made the modification to my wife's computer, and it didn't work at first. The symptoms were that the H-89 died well before booting, the reset key would not work more than once out of 10 tries, and the ROM memory test would not work, but lasted long enough to declare the 32K.

Eighteen hours and two heart attacks later, we discovered that for her late model Z-89 the ORG 0 CP/M mod has been made internally on the board, so for this machine you should not do the step in Steve's article that says ". . . connect a wire from pin 17 of the left expansion bus (P509) to the middle pin on JJ503. Discard the jumper plug that was on JJ503; it's no longer needed."

Instead, for these late-model Z-89's, do not connect the wire, and leave the jumper plug on JJ503 setting B (the right two pins). After clipping the jumper wire and replacing the plug, her computer worked just fine with 64K.

Dr. Jim Gillogly
Topanga, CA

Reply:

Since I submitted my article "Beat the High Cost of H88/H89 Memory Expansion," I have discovered some circuit board changes made to the Heath H/Z-88/89 CPU board.

As was correctly stated by Dr. Gillogly in his letter, the modification as written does not apply to the newer CPU boards. However, it is easily clarified.

On any CPU with the part number 85-2549-1 or higher, simply do not install the jumper to pin 17 to enable CP/M, and leave the connector on JJ503 on the two right-most plugs.

This simple change to the original article should take care of any problem encountered with the newer CPU boards.

Steve Howard
Cottage Grove, MN

A Good Price will Stop Theft

In response to your remarks on software thieves (Publisher's Remarks, September 1982, p. 24):

I understand your position about stolen programs and many groups, either user's groups or dealers, giving away copyrighted materials.

However, I do not understand the justification for the prices charged for the software that is available. I purchased Charles D. Sternberg's books "Basic Computer Programs for Business" Vols. I and II for a total of $24.80. By using the programs presented in the book I was able to get a good mailing list, amortization, simple bookkeeping, an appointment calendar and an inventory control program that serves my needs. The same programs from the software houses would have cost nearly $800.

If the software houses wish to stop having programs stolen they first must present a quality program that has a good price, options to work on many systems with various printers and good manuals so that the full use of the program can be realized. Also, most importantly, they must answer inquiries with decent literature so that a prospective buyer can see what the program can do for him. Perhaps manufacturers should not sell the manual only; this seems to say "OK, if you can get a copy of my program I'll sell you the manual."

Ronald B. Moss
Brandon, FL

Copyright: Right to Copy?

Yes, we support your efforts to cut software theft.

In our store, we seldom sell more than a few of the new programs out; the rest are seen around town in the form of bootleg copies.

We sell one copy of an educational program to a school district and all of a sudden, magically, there are copies in every school for every computer in that district!

It is a frustrating and unprofitable situation! And, for those of us who take the time to write good software, it is quite a loss of revenue when there are so many copies of the "copyrighted" programs around (does copyright mean the right to copy?).

Michael Jaret
Appletree Studio
DeKalb, IL

Pascal and Basic Duel On the Same Computers

Your Basic vs Pascal article (April 1982, p. 140) and the follow-up (August 1982, p. 22) are still in urgent need of a set of consistent timings. The intention of the article by John Sommer was excellent—to use established benchmark programs for the purpose of comparing the speed of Pascal and Basic. However, the computer timings that you have published so far have failed in this purpose. The reason is that there are significant extraneous factors that vary between your timings. In all of your timings, you have never shown both Pascal and Basic operating on the same computer!

Analysis of benchmarks can be complex, yet readers may be interested in the following table of timings. Incidentally, the benchmarking of hardware (micro vs micro) is also valid and of great interest—in fact, the timings you have published so far for MBasic show significant differences between microcomputers.

The timings in Fig. 1 (all scaled for K = 10000) were executed on the same computer! Televideo TS802H (Z80, 4Mhz, CP/M 2.2). The second table shows timings from your August issue (plus TRS-80 Model II) that tend to show differences between computers. I've included a Benchmark #8, which is the Shell Sort that is discussed in the August 1982 and June 1982 issues.

Steve Rothman
Glenwood, NM

COCO Can Go

While browsing through the June issue of *Microcomputing* magazine, I was intrigued by the Martin Oakes letter (p. 22) regarding the speed of the IBM PC against the Apple II. What a joy for me to see comparisons of this type, because it gives me the opportunity to compare the TRS-80 Color Computer with other machines.

I don't want to make Mr. Oakes feel bad, but the COCO beats the IBM PC on all three counts.

I'm still a little confused by what line 70 of Mr. Oakes' program does. In TRS and Texas Instruments Basic it does nothing but create the same number. Substituting the letter "I" for the number "1" solved the problem and generated the appropriate number of random numbers.

Times cranked out by the COCO on the average were:

200 Numbers in 55.3 seconds vs. the 64 for IBM

300 Numbers in 100.7 seconds vs. the 106 for IBM

500 Numbers in 248.8 seconds vs. the 266 for IBM

The COCO beat the IBM by very little, but just remember the COCO with 4K RAM has been selling recently for $299. So if speed is what you're after, you should look at the COCO with 6809 MPU with a little more respect. Even with 32K RAM it can be purchased many places for just over $500. I have never seen a quoted price on IBM or Apple II in that range.

Garrett E. McGowan
Hopewell, VA

Televideo Only: Pascal vs Basic

	#1	#2	#3	#4	#5	#6	#7	Shell
Pascal MT+	1	19	54	69	69	71	78	25
MBASIC (intgr)	7	35	100	97	100	170	260	180
MBASIC (fl pt)	11					190	310	223
CBASIC2 (intgr)	10	80	310	490	490	460	660	209
CBASIC2 (fl pt)	50					920	960	457

MBasic (float pt) only: Micro vs Micro

Televideo 4Mhz	11	35	100	97	100	190	310	223
TRS80 Model II	12	40	114	112	120	210	350	252
North Star 4Mhz	12	40	113	112	118	210	347	
IBM PC	10	50	120	120	140	220	369	266
Atari 800	10	68	127	146	155	245	383	

Fig. 1. These timings (all scaled for K = 1000) were executed on the Televideo TS802H. In second table are timings from the August Microcomputing *(Letters to the Editor, p. 22).*

Reply:

I think you make a valid point: the speed of a computer has very little to do with cost or size. I'm off to my Sinclair ZX81 to see how it compares. . . .

You asked if RND(1) should have been RND (I)? The best answer is neither. In the version of Microsoft Basic used by the IBM PC, RND(x) is the general call. "X" is the seed for the random function. To reseed the function, "X" should be negative. However to produce a different series "X" must have a different value each time RND is called.

As written, the program always generates the same series. This did not matter for timing a shell-sort, but it would have been better to have produced a different series each time the program ran. This could have been accomplished by using the system clock to change the value of "X" each run.

```
54  LET X = VAL(RIGHT$(TIME$,2))
55  RANDOMIZE(X)
70  A(I) = RND*NN
```

Martin Oakes
Freeport, IL

Typo in Micro Quiz

When my answer of seven to September's Micro Quiz (p. 7) did not match the answer given, 10, I quickly checked the analysis on page 15. This led to the obvious conclusion that there was a typographical error in the third line of the algorithm. For those of you who do not have that issue handy, here's how the algorithm appeared:

```
N = 4
FOR I = 0 TO N - 1
  FOR J = J + 1 TO N
    PRINT "MICRO"
  NEXT J
NEXT I
```

The third line should have read:

```
  FOR J = I + 1 TO N
```

to agree with the analysis on page 15 and give an answer of 10.

I have to say that the Micro Quiz is one of the first things I look at when I receive a new issue of *Microcomputing*. I enjoy testing my programming abilities. Keep the quizzes coming!

Robert E. Paehr
East Islip, NY

Reply:

Mr. Paehr is correct. As many of our readers have noticed, the third line should have read:

```
FOR J = I + 1 TO N
```

—Editors

Micro Software Digest

Compiled by Dan Muse

Micro Software Digest presents a collection of capsulized software reviews from various computer-related publications. Beginning this month, Micro Software Digest will be presented in an index-card format; so read on and clip and keep your favorites.

Z80

ScratchPad Version 2.1

System Requirements: Z80-based system, CP/M operating system, 48K RAM, 8-inch, single-density disk, standard 80 × 24 terminal, printer
Manufacturer: Supersoft, PO Box 1628, Champaign, IL 61820
Price: $295
Comments: ScratchPad is a new electronic worksheet program. One of the most important features of the program is its "virtual memory." This memory-management technique "automatically monitors and exchanges the limited RAM space with disk space," the review says. "As a result of this feature, users gain a larger effective memory for processing," according to the review.

"Fundamentally, ScratchPad seems aimed at the shirt-sleeve working environment—that is, for users who demand entry simplicity and fast answers," according to the review. Reader Service number 420.

(Reviewed in InfoWorld, *September 6, 1982)*

CP/M SYSTEM

The Wedge

System Requirements: CP/M system, CP/M 2.2x (or MP/M); 56K RAM, two disk drives, 250K each, CRT terminal with addressable cursor
Manufacturer: Systems Plus, Inc., 1120 San Antonio Road, Palo Alto, CA 94303
Price: $295
Comments: "The Wedge, Version 1.0, is an electronic-spreadsheet package, primarily for business and financial use, with extensive help and teaching facilities built in," the review says.

"Once installed, The Wedge is extremely easy to learn to use. The package provides six lessons for the new user that introduces all of the program's basic functions," the review says.

The program is designed for new users with no technical background. "For the experienced user, the program provides many advanced screen-display and report-generating facilities," according to the review.

The Wedge appears to "do what it does very well," the review says. Reader Service number 421.

(Reviewed in InfoWorld, *September 6, 1982)*

8080, 8085 OR Z80

The Formula

System Requirements: 8080-8085-, or Z80-based system, CP/M, 58K RAM, dual-floppy drives, double-density eight-inch disks for GAS, 5 1/4-inch disks for CBS, printer 80 or 132 columns
Manufacturer: Dynamic Microprocessor Associates, 545 Fifth Avenue, Room 602, New York, NY 10017
Price: $595
Comments: "The Formula allows you to create your own bookkeeping inventory or accounting system just the way you want them," the review says.

The Formula consists of three programs that run under CP/M: CBS (Configurable Business System), GAS (General Accounting System) and the Formula (Free Formula Report Module).

These three programs, and their interrelationships, are complex. "You need to study the manuals, and test the accounting programs," the review says.

"The programs are limited to data processing, but they are more than satisfactory for developing a system to handle your data," the review says. Reader Service number 413.

(Reviewed in InfoWorld, *August 16, 1982)*

8080, Z80, OR 8085

Software Tools for CP/M

System Requirements: 8080, Z80 or 8085 system, CP/M 2.2, 56K RAM (64K recommended), two eight-inch floppy disk drives.
Manufacturer: Unicorn Systems, 30261 Palomares Road, Castro Valley, CA 94546
Price: $265 (object code); $325 (source code)
Comments: "The design of the Software Tools is excellent," the review says.

"The Software Tools is basically a programmer's development system with advanced capabilities," according to the review.

"After you come to terms with nine object-program disks, and the problems of keeping them organized, using the tools is easy," the review says.

The user should be familiar with CP/M and computer systems in general, the review says. Reader Service number 411.

(Reviewed in InfoWorld, *August 9, 1982)*

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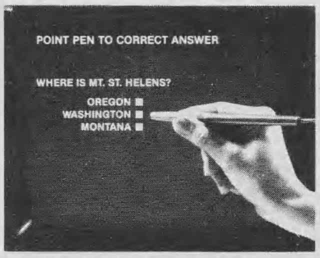

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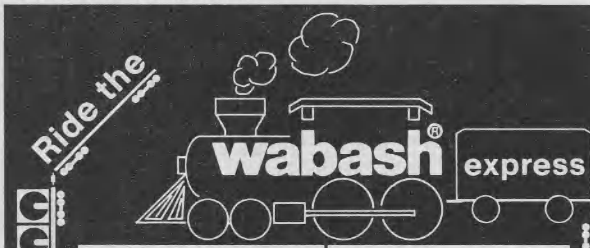

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Write Away

System Requirements: Apple II or Apple II Plus, 48K, one disk drive; Recommended: modified shift lower-case adapter, 80 column card, second disk drive
Manufacturer: Midwest Software Assoc., PO Box 301, St. Ann, MO 63074
Price: $175
Comments: Write Away is a versatile word processor that provides a variety of levels of capability. "Terminology and procedures are quite similar to DEC's PDP word processing software," the review says.

"The expandability is excellent. If one is familiar with DEC procedures, learning time is near zero," the review says.

"Very little can be found wrong with this program," the review says. Reader Service number 424.

(Reviewed in Micro, *September 1982)*

APPLE

Absolute Security

System Requirements: Apple II or II Plus, DOS 3.3, 48K RAM, disk drive with controller, D.C. Hayes Micromodem
Manufacturer: Dann McCreary Software, PO Box 16435, San Diego, CA 92116
Price: $79.95
Comments: "If you are concerned about the privacy of your file transmissions over public telephone lines, this package will help solve the problem," the review says.

"Absolute Security provides the utilities necessary to create, encode and send messages to another Apple computer via the Micromodem II," the review says.

"Encoding and decoding messages with Absolute Security is not difficult, but it is a time-consuming process," according to the review. Reader Service number 422.

(Reviewed in InfoWorld, *September 6, 1982)*

APPLE

Munch-a-bug

System Requirements: Apple II Plus with 48K
Manufacturer: Southwestern Data Systems, 10159-I Mission George Road, Santee, CA 92071
Price: $49.95
Comments: "Munch-a-bug provides a variety of capabilities to aid in debugging assembly-language programs," the review says. "Assembly-language programming is greatly eased with this product," according to the review.

"A particularly valuable capability is the next command which allows tracing but ignores JSRs," according to the review.

Munch-a-bug is designed for experienced assembly-language programmers, the review says. Reader Service number 427.

(Reviewed in Micro, *September 1982)*

APPLE

PenultiCopy

System Requirements: Apple II or Apple II Plus, DOS 3.2 or 3.3, 48K RAM, one or more disk drives
Manufacturer: ALF Products, Inc., 1448 Estes, Denver, CO 80215
Price: $34.95
Comments: "PenultiCopy enables Apple II users to rapidly and accurately copy virtually any DOS 3.2 or 3.3 formatted disk," according to the review.

"PenultiCopy is a high-performance disk-copying program, clearly designed for commercial disk copying or duplicating," the review says.

"All things considered, PenultiCopy delivers the performance promised," the review says. Reader Service number 416.

(Reviewed in InfoWorld, *August 23, 1982)*

APPLE

Amper-Magic

System Requirements: Apple II or Apple II Plus with 32K, Applesoft in ROM or language card and one Disk II with DOS 3.3
Manufacturer: Aurora Systems, Inc., 2040 E. Washington Ave., Madison, WI 53704
Price: $75
Comments: Amper-Magic is "a menu-driven utility program that allows machine-language subroutines to be added to Applesoft programs," the review says.

The program "provides a convenient way to package ampersand routines and Applesoft programs together," according to the review. "Many options are provided for ease of use. For example, any table of subroutines created for use by one program may be saved in a binary file and used as a unit in any other program desired," the review says.

No knowledge of machine language is needed to use Amper-Magic, according to the review. Reader Service number 425.

(Reviewed in Micro, *September 1982)*

APPLE

Combined Enhanced Graphics

System Requirements: Apple II or Apple II Plus with Applesoft, DOS 3.3, 48K RAM, one disk drive, printer
Manufacturer: Computer Station, Inc., 11610 Page Service Drive, St. Louis, MO 63141
Price: $54.95
Comments: "This is a well-done, efficient utility program that gets the job done at a fair price," the review says.

"This program, as the name implies, combines the features of their previous programs with some new ones."

The most striking feature of the program is the list of supported printer-interface cards and printers, according to the review. "It would be easier to list those printers that are not supported by the program," the review says. Reader Service number 414.

(Reviewed in InfoWorld, *August 16, 1982)*

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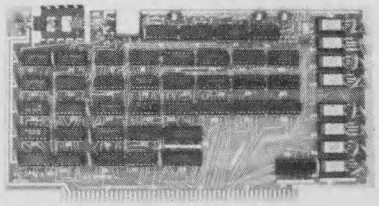

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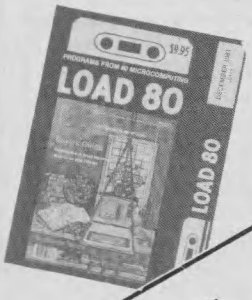

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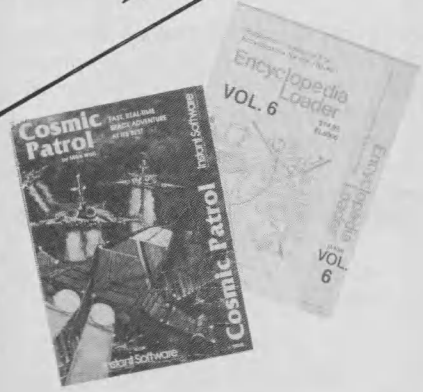

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APPLE

GPS Professional Version 1.0

System Requirements: Apple II with game paddles or joysticks, DOS 3.3, 48K RAM, one or two disk drives, printer, 16K RAM card, Apple Graphics Tablet
Manufacturer: Stoneware Inc., 50 Belledere St., San Rafael, CA 94901
Price: $99.95 (professional version), $59.95 (standard version)
Comments: "GPS (Graphics Processing System) is a powerful program that facilitates the creation of computer graphics; users do not need to have any programming skills if they want to create high-resolution graphic pictures with it," the review says.

"The software is good, but it cannot make drawings for you," the review says. Practice is necessary if you want to create high-quality graphics, according to the review.

"For individuals who possess immense patience rather than artistic ability, the Graphics Processing System will be of interest," the review says. Reader Service number 419.

(Reviewed in InfoWorld, *August 30, 1982)*

APPLE

The Organizer

System Requirements: Apple II, Apple II Plus, two disk drives
Manufacturer: Conceptual Instruments Co., 4730 Warrinton Ave., Philadelphia, PA 19143
Price: $250
Comments: The Organizer contains those functions which will be valuable to the executive—for example: a note generator, a small filing system, a programmable calculator, a clock and an appointment calendar.

"The neat thing here—the thing that makes this program really interesting—is the interlinking of each of the program segments with all the others," according to the review.

"There are other features," the review says. "For example, the program handles tasks normally assigned to an operating system, like maintenance of directories; formatting of disks; copying disks; communications with I/O and mass storage devices; and error detection and recovery," according to the review. Reader Service number 417.

(Reviewed in Personal Computing, *September 1982)*

IBM

EasyPlanner

System Requirements: IBM Personal Computer
Manufacturer: Information Unlimited Software, Inc., 204 Marinship Way, Sausalito, CA 94965
Price: $195
Comments: "EasyPlanner has the power of many spreadsheets combined in one," the review says. "It gives the user the ability to divide a planning task into easily manageable segments, and to devote a spreadsheet to each," according to the review.

"Spreadsheets are printed in a versatile format by merging EasyPlanner with the EasyWriter II program. . ." the review says.

A toll-free number is provided to help the user solve any problems or assist with individual applications. Reader Service number 418.

(Reviewed in Personal Computing, *September 1982)*

IBM

The Speed Reader

System Requirements: IBM PC, PC DOS, 64K RAM, one disk drive
Manufacturer: Davidson & Associates, 6069 Groveoak Place #14, Rancho Palos Verdes, CA 90274
Price: $74.95
Comments: "The Speed Reader has some features that make it a useful educational tool," the review says.

It makes "good use of the microcomputer to help train your eye movements and improve your overall reading abilities," the review says.

The main menu consists of eight items: two warm-up exercises, three reading lessons and three items called Change Screen Display, Stop For Now and Run Demonstration Program.

"If you already own an IBM PC, this package allows you to expand its uses," according to the review. Reader Service number 415.

(Reviewed in InfoWorld, *August 23, 1982)*

COMMODORE

PAL (Personal Assembly Language)

System Requirements: Versions available for all Commodore computers except the Basic 1.0 PET; printer and Commodore disk or tape optional
Manufacturer: Brad Templeton, 271 Westcourt Place #201, Waterloo, Ontario N2L 2R8, Canada
Price: $50
Comments: "PAL is a complete 6502 assembler, entirely in machine language," the review says. "Its syntax is like that of Commodore's own assembler, except that it uses ordinary program files instead of sequential data files," according to the review.

"PAL is extremely simple in concept, flexible in use and powerful in skilled hands," the review says. It occupies only 4K bytes of memory, and it may be placed in EPROM leaving even more memory free, according to the review.

The user must be familiar with Basic's screen editor and 6502 assembly language. Reader Service number 426.

(Reviewed in Micro, *September 1982)*

COMMODORE

The WIZ Database Manager

System Requirements: CBM 8032 or 8096 computer with 8050 disk drive. CBM or ASCII printer optional
Manufacturer: Dr. Daley Software, Water Street, Darby, MT 59329
Price: $495
Comments: The WIZ is a data manager that handles vastly larger numbers than competing programs, the review says. The program also includes built-in plotting, screen input editor, programmable arithmetic and simple report handling.

The WIZ "includes a listing to allow reading and writing its data from other programs, and can jump from itself to other user programs. Better yet, it can read in data from sequential disk files, avoiding retyping when upgrading from a lesser data package," the review says.

"Beginners should be able to use this package effectively," according to the review. Reader Service number 423.

(Reviewed in Micro, *September 1982)*

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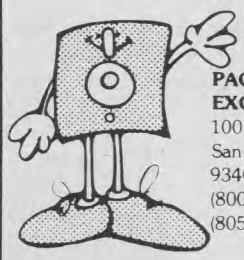

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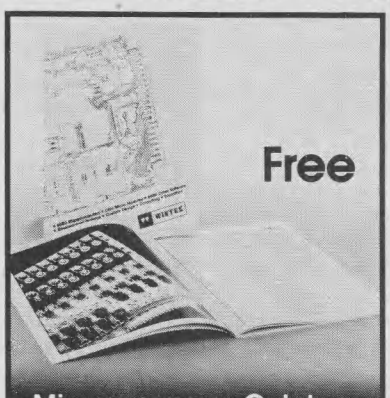

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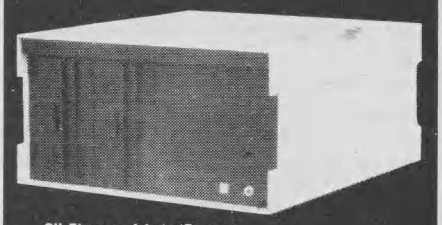

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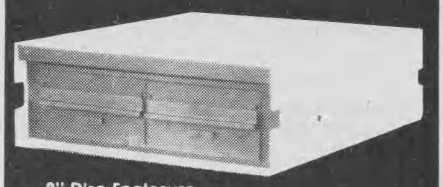

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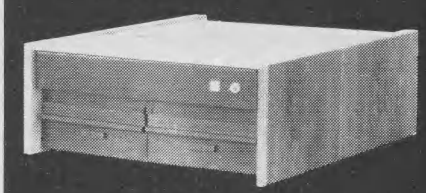

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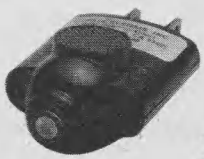

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NORTH STAR, CPM

Magic Typewriter

System Requirements: North Star system, CP/M, 47K RAM, one double-density 5 1/4-inch disk drive, printer
Manufacturer: California Digital Engineering, PO Box 526, Hollywood, CA 90028
Price: $175
Comments: "Magic Typewriter is a word processor written in Z80 code for CP/M and the North Star system environment," according to the review.

"Magic Typewriter can merge two or more files, construct form letters, provide left- and/or right-margin justification, centering, odd-even page headings and page numbering," the review says.

"There are no unusual function keys or cursor-control keys for you to learn. This operational simplicity is a strong point," according to the review.

"The price of this product might lead one to expect more features. For example, it would be nice to see an automated method of generating tables of contents, indexes and footnotes," the review says. Reader Service number 412.

(Reviewed in InfoWorld, *August 9, 1982)*

ATARI

Basic A+

System Requirements: Disk drive, at least 32K of RAM.
Manufacturer: Optimized Systems Software, Inc., 10379 Lansdale Ave., Cupertino, CA 95014
Price: $80
Comments: "In effect, Basic A+ is an extension of Atari Basic, adding a multitude of commands and improving others," according to the review.

"Basic A+ adds DOS commands to Basic, making disk handling by a program much easier," the review says.

"Basic A+ is a feature-packed, easy-to-use language. The scope and range of Basic A+ makes it a truly professional language, worth the consideration of any serious programmer," the review says. Reader Service number 410.

(Reviewed in Compute, *August 1982)*

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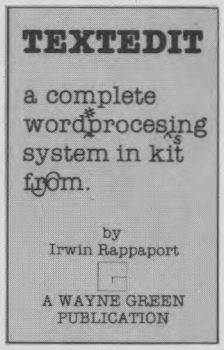

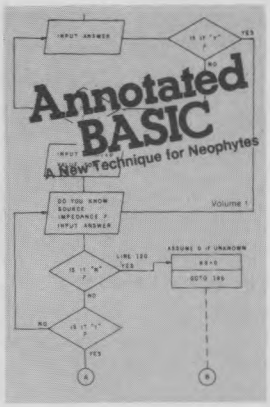

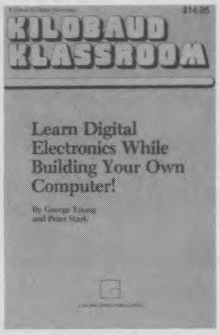

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Micros—In a New Light

If you've been considering adding solar heating to your home, you'll want to control the system with a microcomputer for maximum comfort and efficiency.

By James A. Gupton, Jr.

Authors's Note: The Basic Controller was originally produced by Dynabyte, Inc. and this product was acquired by Action Instruments Company, Inc. in 1981.

The emphasis on solar energy since 1973 gives the impression that this is a brand new method for heating household water supplies. Actually, homes in southern Florida have used solar water heating systems since the mid-1920s and, of course, we have long used the sun to evaporate sea water in order to obtain salt.

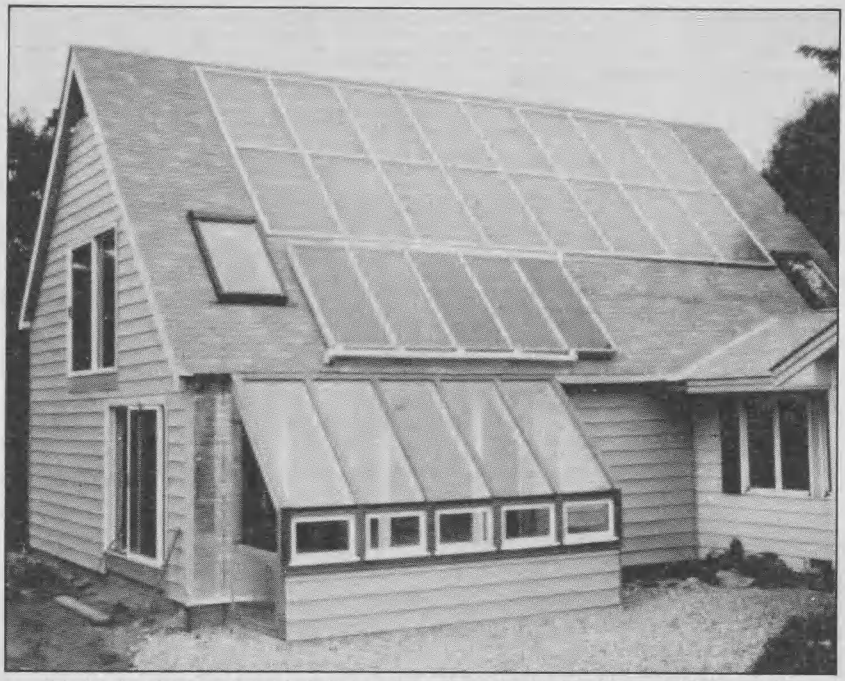
Even as far back as 2000 B.C. people have used the roofs of their houses to collect rain water, which was heated by the sun for laundry and baths. Perhaps the only difference between these earlier uses of solar energy and today's is the cost of installation and control of the system's temperature.

For the past 40 years, electricity has been our cheapest form of energy. So inexpensive has been electricity that our hot water heaters have been manufactured with only a minimum of heat-retaining insulation. However, today's cost of electrical energy is so high that lower-cost methods for heating are economical to explore.

Roof-type solar cells are practical in supplementing any home's hot water supply. With supplemental fireplace heating, they can heat the home as well.

Adding solar energy water heating to your home can qualify you for federal and state tax credits which could amount to as much as 66 percent of the total cost of the system. This tax credit, plus the annual savings of several hundred dollars in water heating bills, would pay for the system in two to three years.

Nothing could be more timely than to consider adding solar energy heat to your home now. The increased volcanic dust in our atmosphere alone promises colder winters and subsequent higher heating costs.



Solar hot air and water system and solarium greenhouse designed and built by Warmrays (Washington, MA).

Fig. 1 illustrates a modified version of the Heathkit NS-1100 Solar Water Heating Kit, which you can install yourself with a minimum of hand tools and for less than $2300 for a two-collector system. In principle, the Heathkit NS-1100 system is based on a closed system between the roof solar collector cells and the heat exchanger.

Water containing an anti-freeze solution is circulated through the solar cells, picking up the radiant heat from the sun, and then pumped back through the heat exchanger, passing off the heat to water being circulated between the storage tank and the heat exchanger. As hot water is taken from the regular hot water heater, cold water enters the storage tank. This forces heated water into the regular water heater to replace the used-up hot water.

Is such a solar energy water heater practical? On any clear sunny day, as much as 900 to 1000 British Thermal Units of radiant energy is received from the sun on every square foot of your roof. Even on cloudy days enough infrared energy will be received to supplement your hot water supply.

The Heathkit's NS-1100 solar collector cells are rated for 945 BTUs per cell per day. Thus, each cell producing 22,680 BTUs could total as many as 60,000 BTUs for only three collector cells. This is almost 50 percent of the average home's furnace BTU output and more than enough heating capability for the average home's hot water use.

The basic NS-1100 solar water heater is controlled only by temperature, which activates the system's two pumps to circulate water in the closed external solar cell/heat exchanger system and the storage tank/heat exchanger open loop system. However, to expand the solar energy cost sav-

Address correspondence to James A. Gupton, Jr., 7416-G Pebblestone Drive, Charlotte, NC 28212.

ings to include heating of the home as well as heating of water, a computer control system becomes practical.

Using a fireplace to supplement hot water heated through the solar energy collector cells starts to complicate control of the system. Normally, the water temperature of a typical collector cell can reach 180 degrees Fahrenheit; the addition of a dual fireplace heat collector system could run the temperature above 212 degrees Fahrenheit.

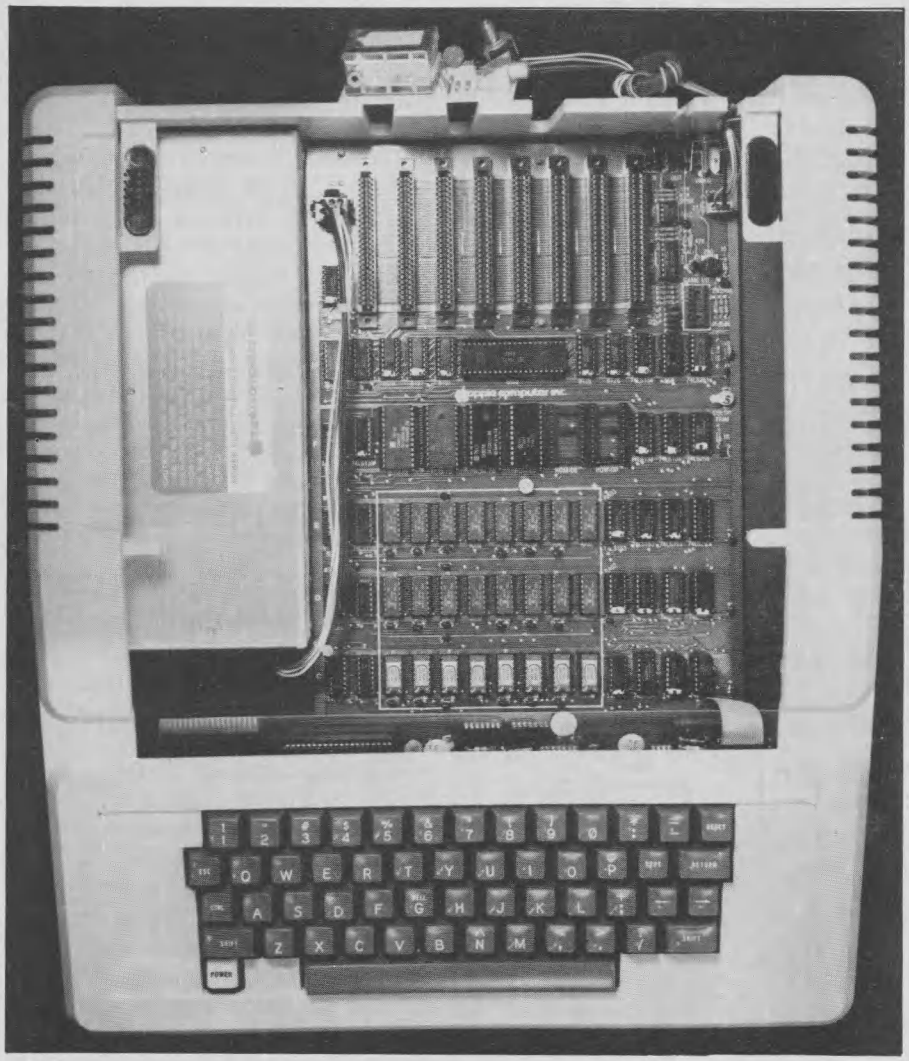


Photo 1. "Peeled" Apple II shows the seven accessory expansion edgecards across the rear of the computer.

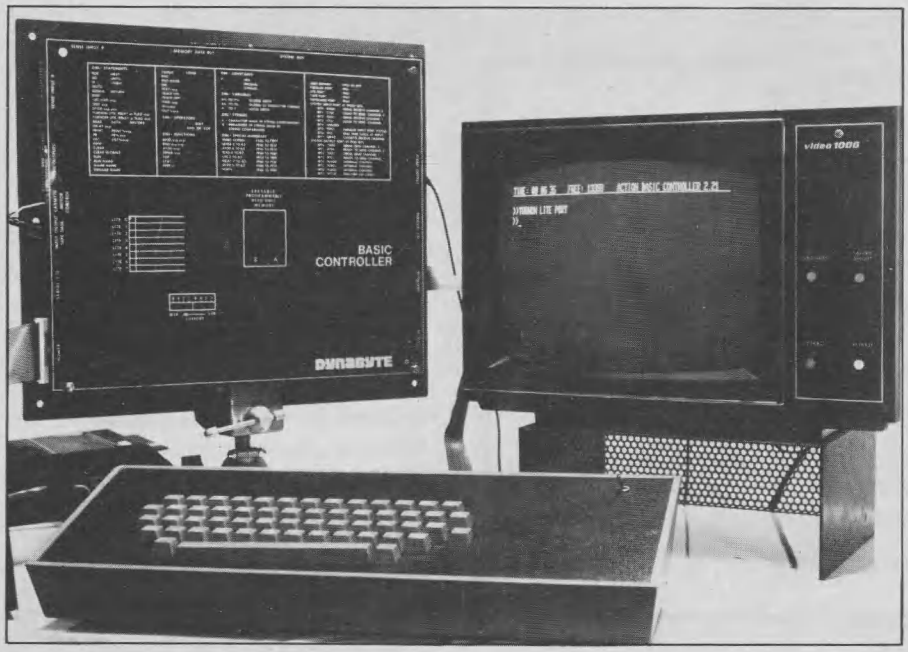


Photo 2. Basic Controller computer system. (Photo courtesy of Action Instruments Company, Inc.)

The basic heat collector for the fireplace consists of the grate collector boosted by a second collector in the flue of the chimney, and unless the system is under pressure, boiling will occur and steam pockets will prevent proper circulation of the hot water to the heat exchanger.

Fig. 1 shows the electrically-operated three-way water valves which are controlled by a computer to regulate the direction of water flow on the solar/fireplace input side of the heat exchanger and the hot water heater/baseboard heaters on the hot water output side.

Referring to Fig. 1 again, when the solar collector is generating hot water for the water heater, valves A and B have normally closed sections closed. In this state, cold water can only enter the storage tank, with heated water in the storage tank passing on to the existing water heater. Valves C and D have their normally-closed section closed—thus the circulation of water/antifreeze solution is between heat exchanger and solar collectors only.

With the fireplace contributing to the heating of water, valves C and D open the circulation paths only to the higher temperature water sources—solar cell or fireplace. When thermostat settings in any individual room call for an increase in temperature, valve B closes to permit pumping of heated water through the house baseboard hot water heaters.

Fig. 2 illustrates the floor plan of an average size home with the addition of baseboard hot water heaters indicated by the letter A. A bypass valve, B, channels the hot water around the baseboard heater when the room's temperature matches the desired thermostat setting. When each room has reached its proper temperature, the baseboard circulation pump turns off and valve B returns to channeling the heated water to the regular hot water heater.

By enclosing a south-facing front or rear porch area with glass, a greenhouse effect is created with sunlight heating the air within the enclosed area. If no porch exists, a glassed-in enclosure can be constructed on any south-facing side of

the building.

Ductwork from the greenhouse section draws heated air into the opposite side of the house, which in turn circulates throughout the house on its passage back to the greenhouse section. This requires the duct fan to run only when more heat is needed.

External sensors anticipate temperature rise or fall in step with increase or decrease in sunlight intensity; the heating system channels hot water through baseboard heaters before normal house heat loss reaches a level where reheating would require additional heat above the capability of the solar/fireplace system.

Fig. 3 is still another solar/fireplace system in which the home heating system heats air as it is blown through the heat exchanger. This is characteristic of most gas- or oil-heated home furnaces.

In addition, Fig. 3 includes a microcomputer control system with all valves operating on 12 V dc from a bank of rechargeable lead-acid batteries. Here the batteries are charged by solar cells and a wind-driven generator. This type of solar/fireplace system will function even when the normal household electrical power has been interrupted as a result of storm-damaged power lines. Remember, no standard heating system can function under these conditions; thus, solar/fireplace heat is far more reliable.

The solar energy heating of hot water for supplementing the existing hot water heater is a simple minor control system.

Add home heating and rechargeable battery-operated systems and you'll need a computer to control the system. By having the heating of your home's hot water and heating of the house in winter controlled by a computer, you'll reduce the cost by maintaining greater efficiency and subsequently higher comfort levels throughout the years.

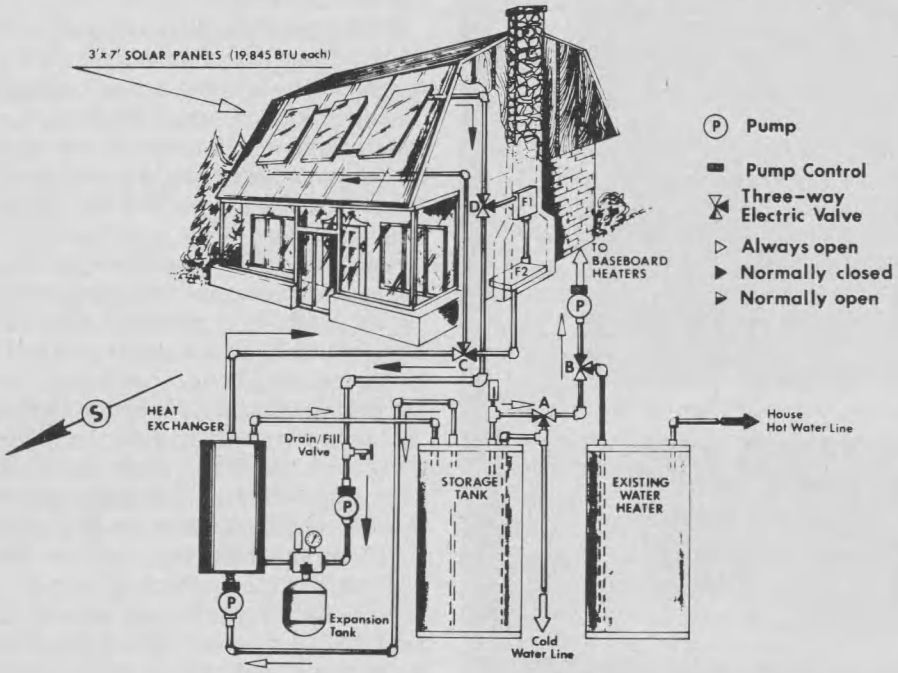


Fig. 1. Basic solar hot water and heating concept.

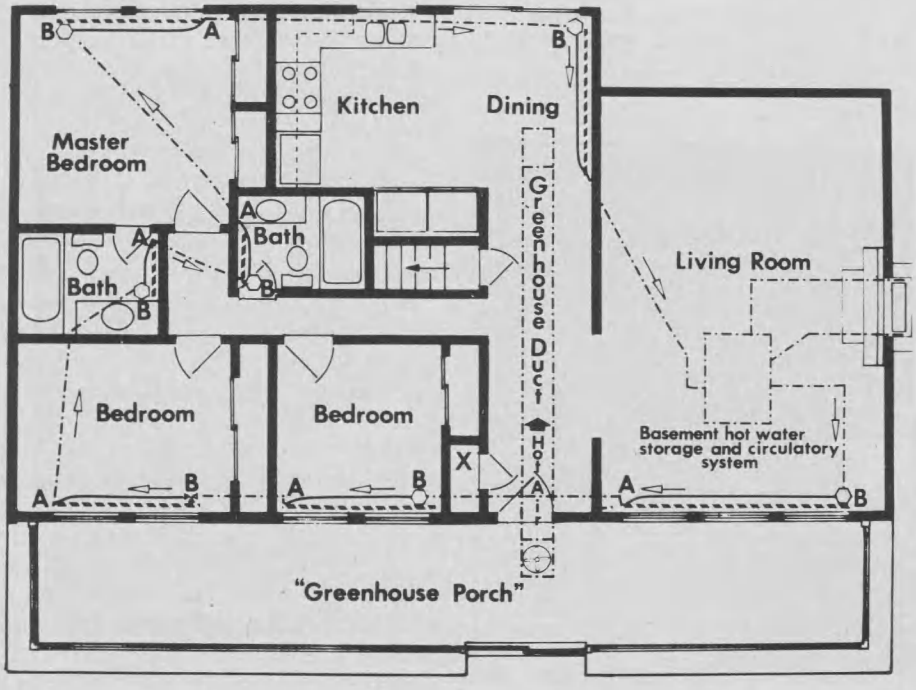


Fig. 2. Solar energy home's inside baseboard heater and control.

Selecting a Computer for Solar Energy Control

The typical home in Figs. 1 and 2 would require a computer to control a minimum of 11 valves, three water pumps and the greenhouse duct fan. In addition, a total of 13 temperature sensors would be needed to supply the computer with input signals for system temperature regulation.

The minimum interface requirement to control this solar energy system would be two parallel Input/Output ports containing a total of 16 output and 16 input control signals. A peripheral interface adapter (PIA) would normally consist of two 8-bit registers, A and B, plus two bidirectional driver circuits with either inverting or noninverting drivers.

Fig. 4 illustrates in schematic how the PIA register A data is transmitted to the controlling relay of a three-way water valve. In the non-inverting driver, a logic 1 (+5 V dc) is transmitted to the base of a PNP transistor which biases the transistor to saturation while developing a positive voltage across the collector's load resistor, which actuates the relay coil.

For an inverting driver, a logic 0 (0 V dc) input produces a logic 1 (+5 V dc) at its output which, when applied to the base of an NPN transistor, biases the transistor to saturation and the collector voltage drops to 0 V dc to turn off the relay coil.

The problem with most popular microcomputers is their lack of provisions and interfaces suitable for external device control. Few, if any, offer additional edgecard connections to add to parallel I/O ports containing a

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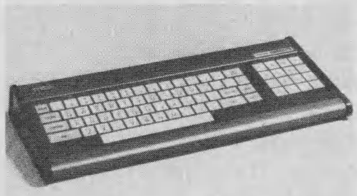

Reliable, portable RCA VP 3000 series Interactive Data Terminals feature: video and audio output; color-locking circuitry for sharp color graphics and rainbow-free characters; reverse video; tone and noise generator; 20 and 40 character formats; resident and programmable character set; LSI video and microprocessor control. All have a unitized 58-key, 128 character keyboard with flexible membrane switches, plus the features of the ASCII keyboards below.

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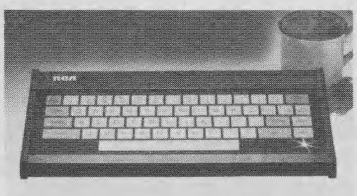

RCA VP 600 series ASCII keyboards feature: flexible membrane keys with contact-life over 10 million operations; unitized keyboards are spillproof, dustproof with finger positioning overlay and positive keypress; 2-key rollover circuitry; tone feedback; high noise immunity CMOS circuitry; 5V DC operation and 58-key, 128-character keyboard, selectable "upper case only."

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*Optional user prices.

PIA. Those that do offer parallel printer interfaces lack the essential bidirectional operation to receive input control data.

At the present, most practical parallel I/O interfaces seem to be confined to either the S-100 bus computers or the 44 connector edgecard system. California Computer Systems offers an S-100 motherboard with interfacing to the TRS-80 and the Commodore PET microcomputers so that S-100 bus relay control interfaces may be used instead of the parallel I/O interface.

The Apple II Plus microcomputer has built-in provisions for up to seven accessory interface circuit boards. Photo 1 illustrates a "peeled" Apple showing the seven edgecard circuit board connectors across the rear of the computer. Even with dual disk drive units and a line printer, the Apple II still has room to accept up to five parallel I/O interfaces equipped with a PIA or interface to an external S-100 motherboard system.

The Apple II offers still another advantage as a control computer—it has several different languages to develop the complex solar energy control program.

When you select a microcomputer with solar energy systems control in mind, you may find that the Action Instruments' Basic Controller fills your needs. It can sense mechanical contact closures, control electromechanical devices directly, sense and convert analog transducer signals and transform any program permanently on EPROM.

Even the physical appearance of the Basic Controller is different (see Photo 2). It doesn't have the usual case because it's designed to be mounted on a metal rack, not for desk use. Its single board construction contains on-board edgecard connectors for a total of 32 sense inputs, 32 flag outputs and 16 interrupts.

In addition, the Basic Controller contains 16K ROM in which the special Zilog Industrial Basic Language is stored. On-board RAM capacity is 16K with provisions to expand to 64K with off-board circuits. Up to 8K EPROM is available with on-board EPROM storage of programs executed by the simple loading instruction, LIST %7. You can even copy EPROMs by placing an EPROM in socket A and an unprogrammed EPROM in socket B and by entering the PROMCOPY program from the prerecorded cassette.

There are eight on-board relays, four of which have contacts rated from 5 A at 26 V dc to 3 A at 115 V ac. The remaining four are reed relays with a 10 VA contact rating. To provide visual feedback in certain control situations, eight LEDs are positioned on the front panel to indicate an ON or OFF condition to the operator. In addition, the 8-bit parallel I/O port will display the contents of its register by an Off/On status of eight LEDs.

The ZIBL language simplifies the development of control programs. In cases where mechanical contacts of a thermostat are used to control bypass baseboard heaters, the program in ZIBL might be this:

```
IF SENSE (13) = 0 THEN TURNON FLAG 13
DO UNTIL SENSE (13) = 1 THEN TURNOFF
FLAG 13
```

In this case, sense 13 would represent the lower temperature limit and would turn off the bypass valve when the temperature caused the grounded bimetal contact arm to break contact, returning a logic 1 to sense input 13.

The Basic Controller has a 24-hour on-board clock, by which time can be used to activate system controls. For example, suppose we are using the fireplace heating system to heat the house at night and we wish to reduce the heat when we retire. The program might look like this:

```
IF TIME = 160000 THEN TURNON SENSE (C),
(D), (P)
IF TIME = 220000 THEN TURNOFF SENSE
(C), (D), (P)
```

Thus, at 4 p.m., when there is little solar heat being produced during winter, the program would automatically switch the system over to fireplace-generated hot water and keep it on until 10 p.m.

As a complementary feature to the Basic Controller, Action Instruments also offers a complete line of sensors for temperature, pressure, rate of flow of liquids and computer to controlled device transmitters. ■

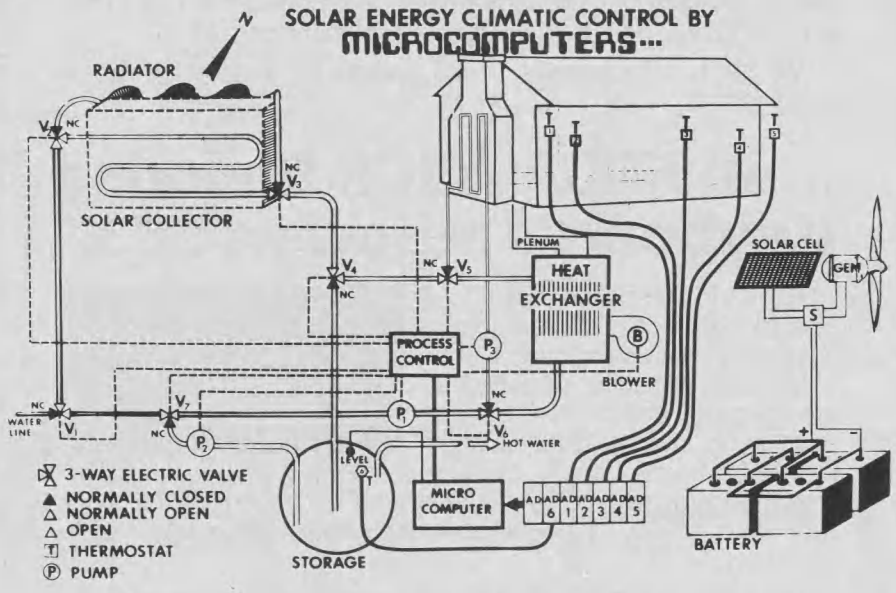

Fig. 3. Computer controlled solar energy heating.

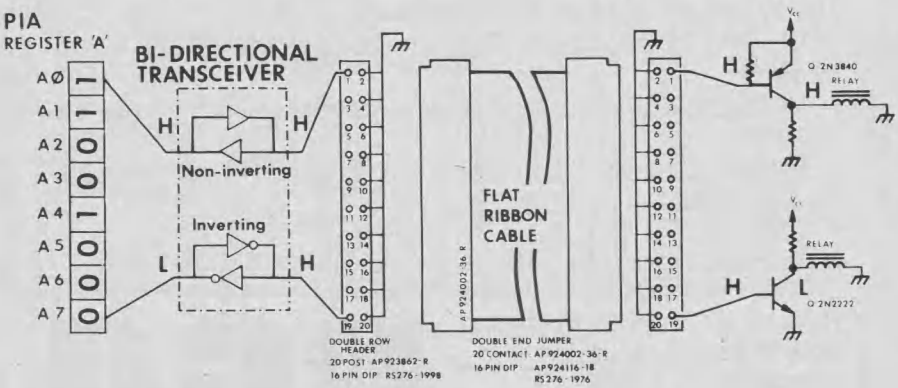

Fig. 4. PIA output register connections to system driver relays.

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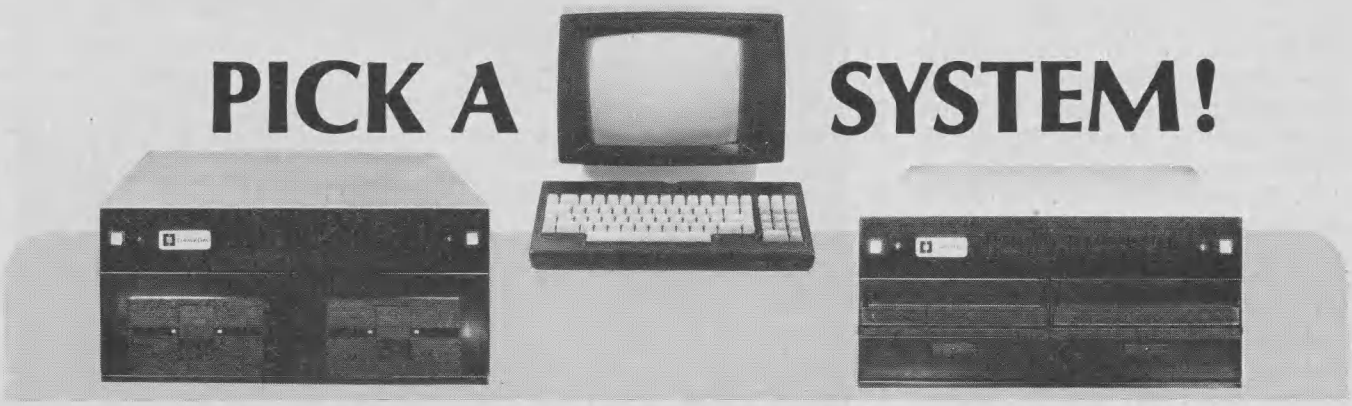

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Micros Find a Place Under the Sun

Micros are hot stuff when it comes to collecting and analyzing data on the efficiency and usage of solar hot water systems. This project at the Florida Solar Energy Center used a Commodore 8032 microcomputer.

By Timothy Stryker

Florida is an ideal area for the application of solar energy collection techniques. Except during the rainy season from May through mid-July, cloud cover is minimal, and the latitude of the state provides it with more direct solar rays than any other state besides Hawaii. Naturally, there is little need here for space-heating energy, but even in a warm climate people need hot water supplies for washing clothes and dishes and taking showers.

For this reason, the Florida Solar Energy Center (a division of the University of Central Florida) has undertaken a research project to determine the relative efficiencies, usage patterns and electrical requirements of various residential hot water systems, conventional as well as solar, at various points around the state.

To do this, the Solar Energy Center installed special metering systems in 80 typical residences throughout the state. The 6502-based metering system accumulates electricity usage, water volume usage and BTU (British Thermal Unit) usage data as a function of time. Each metering system also incorporates a 300-baud modem and is tied into a separate telephone line at each house, so that the accumulated data can be remotely accessed every few days by a "master" computer located at the Solar Energy Center.

The goal is to collect a full year's worth of data, at 15-minute intervals, from each house, so that a comprehensive picture of hot water costs as a function of latitude can be obtained, as well as time of year, time of day and system type.

Photo courtesy of Gulf Thermal Corp.

System Hardware Configuration

The metering system selected was the LPR (Load Profile Recorder) manufactured by Robinton Products, Inc. of Sunnyvale, CA.

This device can accumulate relay contact closure pulse data on up to three channels for up to six days at 15-minute intervals before overflowing its internal RAM memory. It also incorporates a 103-type DAA modem and has built-in power-outage sensing and battery-backup circuitry so that its accumulated data will not be lost or disturbed by power line fluctuations.

Software supplied in EPROM with the unit handles data accumulation, modem communications and time/date maintenance.

Robinton has available a master utility program called ALICE, written in Fortran for the PDP-11, which handles automatic uploading of LPR data, maintaining this data on disk, and various report-generation functions. Robinton wanted a ridiculous amount of money for this program, though, so the Solar Energy Center decided to write its own software for the 6502-based CBM 8032 microcomputer

Address correspondence to Timothy Stryker, Samurai Software, PO Box 2902, Pompano Beach, FL 33062.

from Commodore.

The 8032 is a beautiful little machine, ideal for this type of application, with 32K of RAM, a full alphanumeric keyboard and a built-in 80-column monochrome display. Together with the 8050 double-density dual floppy disk drive from Commodore, the TNW-103 auto-dialing modem from TNW Corporation of San Diego, a Model 1001F DAA data coupler from Universal Data Systems of Huntsville, AL, and an NEC Spinwriter, the system provided us with everything we needed for high-volume automated data collection and analysis, at a reasonable price.

Applications Software

TNW Corporation supplies a general-purpose modem-interfacing program called XPTERM-103 that can be used to transfer disk files between Commodore machines and call up remote mainframes. We decided to use XPTERM as a starting point for writing our own LPR data-uploading software. The fact that it is written in Basic made most of this adaptation process very easy, but we ran into a few snags along the way. The snags were due to Basic's speed—or rather lack of same.

The first problem concerned the computation of "block check characters." Telephone lines are notorious for the amounts of noise they introduce into audio signals. For this reason, Robinton chose to implement a full two-byte CRC (cyclic redundancy check) scheme in their modem communications protocols for the LPR.

The CRC scheme, developed by IBM for the purpose of maintaining data integrity in telecommunications, is a relatively complicated scheme involving considerable shifting and XORing of each byte of transmitted and received data. Attempting to carry out these computations in Basic would have taken too much time, so we had to resort to machine language for this process.

None of the people at the Solar Energy Center had had much experience with machine language, so the development of the necessary routines was highly problematic at first—it was at this point that they bit the bullet and called in a high-priced computer software consultant, me.

Once this problem was out of the way, I found that Basic was too slow even to receive data from the LPR on the communications line in real time. Although the modem could be OPENed from Basic as a device, and Input and Get commands could be issued to it, the lack of buffering in the modem, the sloth of Basic and the peculiarities of the LPR data formats conspired to make it impossible to reliably retrieve data.

Again machine language was needed, this time simply to read data from the modem while checking modem status and timeout conditions. This required some detailed knowledge of the 8032's ROM-resident operating system, which, fortunately, I happened to have available.

However, we encountered one last major problem in this phase of the effort. Once the communications all seemed to be working, I set up the program to transmit the appropriate control codes to the LPRs, and everything seemed to be fine, with one exception: the LPRs would not log data. The program would initialize an LPR and fire up its "load-profiling task." The replies received were all strictly according to Hoyle, except that the data values were always zero.

After we spent weeks of checking and rechecking the hardware—with me poring frantically over the software—a single sentence came over the line: "You have to set location $0220 in the LPR to an $80 in order to enable data logging." No hint of this is contained in the LPR documentation. This certainly drove home the point, if it ever remotely needed to be, that complete and well-reviewed documentation is of the utmost importance in determining the value and utility of a commercial electronic product.

Database Management and Analysis

Now that the LPRs were producing valid pulse-counts, we needed some way to examine the data, some way to merge the separate, six-day-long data segments into larger agglomerations and some way to compute totals, averages and other information from the data gathered.

The application was sufficiently unique, and in particular, the volume of data was sufficiently high, so that no existing database management package for the 8032 could be effectively used. We would have to write our own, and so the question naturally arose as to what language to write it in.

Assembly language was out of the question for numerous reasons. Basic could have been coerced into doing the job, but its speed, I knew, would continue to be a problem, and the structure of the language is such that it is poorly suited for the creation of large, complex data manipulation programs.

Coincidentally enough, I happened to have developed a language called RPL for the Commodore line which combines high speed with a number of features well-suited to the generation of lengthy, involved programs—among them a stack-oriented architecture (like that of Forth); a symbolic, single-stepping, breakpointable debugger; separate compilation capability; and efficient usage of memory space. In addition, RPL uses Commodore's Basic program editor for the editing of its source, which makes the management and updating of its source files far easier than would be the case with, say, Forth.

The first item of business, then, was to allow the raw LPR data files to be merged together into larger, "database" files. Since a year seemed to be the longest time-span of interest, we hoped to be able to fit all of the data for a year, from one house, into a single file. With each of three channels generating a data value every 15 minutes, this worked out to 105,120 data values per house per year.

Since the analysis of this data would require that we be able to pick and choose a data-point here and a data-point there, the organization of the data in a sequential file format was clearly unacceptable. But Commodore "relative" (known elsewhere, usually, as "random-access") files only allowed a maximum of 720 records per file.

What to Do?

The solution was to treat each of the 720 records in a maximum-length relative file as though made up of many subrecords, each subrecord containing 15 minutes worth of data. I then wrote a set of RPL routines that made it appear to their callers as though each subrecord was, in fact, a record unto itself.

This sort of thing is fairly easy to do in RPL, and the speed of the language is such that the resulting programs run considerably faster this way than they would have with the several tens of thousands of separate records that I would have needed to accomplish this otherwise. In this sense, Commodore's 720-record limitation was a blessing in disguise.

Having merged the raw LPR data files, we then needed to be able to review and edit the resulting database files. If I had been writing the program

in Basic or assembly language, this database-editing facility probably would have been limited to a simplistic prompt-driven process ("WHAT DAY?", this, "WHAT TIME?", that, "CURRENT VALUES: so-and-so... CHANGE?", yes or no, etc.). To do more than this in Basic would have taken too long to execute, whereas to do more than this in assembly would have taken too long to code up.

Using RPL, I was able to write a full-fledged database screen editor, virtually from scratch, in about 12 hours. The editor allows the user to view a full 24 hours worth of data at once. The cursor keys may be used to scroll forward or backward an hour, a day or a month at a time, and any change made to the data on the screen automatically causes the corresponding change to be made to the database file on disk. The flashing cursor cannot be moved into illegal regions of the screen—in fact, invalid key inputs of all kinds are simply ignored.

Most importantly, the scrolling takes place at virtually the full speed at which the disk itself is capable. This makes it very easy for the Solar Energy Center people to maintain full visibility into, and control over, the database at all times.

The ultimate aim of the project is, of course, to derive useful information from the raw data that will be collected. To this end, I now wrote a program to find totals and averages for specified house groups over specified durations of time. At first, the program merely spit out a table of data, averaged, by 15-minute intervals, over the specified house-days.

With the help of Tim Merrigan at the Solar Energy Center, though, this program gradually grew to include average daily totals, overall interval averages, the top three readings from each of the channels and a so-called "coefficient of performance," an overall measure of how the hot-water systems under consideration performed in terms of efficient use of electrical energy.

Finally, I was able to use the plotting capabilities of the NEC Spinwriter to generate graphic profiles of the average consumption of kilowatt-hours, gallons and BTUs over the course of a day.

Conclusion

The Commodore 8032 is a fine machine in every respect. The 8050 disk drive, while somewhat flaky at times, is nonetheless an outstanding value for the money, and in combination with the 8032 simply cannot be beat.

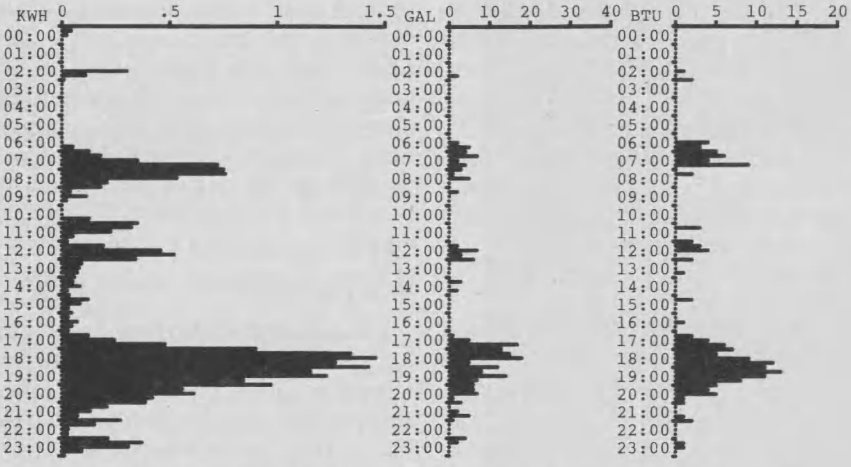
The modems and software that we purchased from TNW Corporation have performed, without exception, flawlessly. Our data couplers from Universal Data Systems have also quietly worked, from day one, without problem. The NEC Spinwriters we used have been largely trouble-free, except for ribbon-positioning, and this has not cropped up again after having been fixed several months ago. Our Load Profile Recorders from Robinton Products, Inc. have worked reasonably well, the main problems lying, as noted above—ahem!—in their documentation.

The performance of RPL in this project met every demand placed upon it. Although the language is not really designed to handle floating-point or even multi-word-integer quantities, I found it necessary to write only a few specialized routines in assembly language. RPL's use of the Basic screen editor, its high space-efficiency and the power of its debugger combined to make the development of the project software as easy and trouble-free as could be desired.

As proof of this, consider that, since my contract with the Solar Energy Center was on a time-and-materials basis, I kept track of the exact amounts of time I spent on the project. From soup to nuts (including all of the horsing around with the LPR, travel time, phone call time, and so on), the software took just 145 hours.

The overall conclusion that we at the Florida Solar Energy Center have drawn from this project is that today's microcomputers are sufficiently powerful to address many applications heretofore handled only by minicomputers. When potential cost savings are considered, departmental managers may find that a microcomputer-based approach to their computing needs offers the optimal solution. ■

Florida Solar Energy Center Residential Hot Water Project
Scaled Averages For The Solar House Group




```
TOTAL, CHANNEL 1: 23,344 WATT-HOURS .., / 2 HSE-DAYS = 11672 WATT-HOURS
TOTAL, CHANNEL 2: 212 GALLONS ... / 2 HSE-DAYS = 106 GALLONS
TOTAL, CHANNEL 3: 163,000 BTU'S ... / 2 HSE-DAYS = 82,000 BTU'S

AVERAGE BY INTERVAL, CHANNEL 1: 307.16 WATT-HOURS ... X 96 = 29487.36 WATT-HOURS
AVERAGE BY INTERVAL, CHANNEL 2: 2.79 GALLONS ... X 96 = 267.84 GALLONS
AVERAGE BY INTERVAL, CHANNEL 3: 2,140 BTU'S ... X 96 = 205,440 BTU'S

WATT-HOUR MAXIMA:
  1. 1460 (HOUSE NO. 1 AT 18:15 ON 7/1/82)
  2. 1424 (HOUSE NO. 1 AT 18:45 ON 7/1/82)
  3. 1340 (HOUSE NO. 1 AT 18:00 ON 7/1/82)

GALLONS MAXIMA:
  1. 18 (HOUSE NO. 1 AT 18:15 ON 7/1/82)
  2. 17 (HOUSE NO. 1 AT 17:30 ON 7/1/82)
  3. 15 (HOUSE NO. 1 AT 18:00 ON 7/1/82)

KILO-BTU MAXIMA:
  1. 13 (HOUSE NO. 1 AT 19:00 ON 7/1/82)
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Sample printout showing average consumption of Kilowatt-hours, gallons and BTUs.

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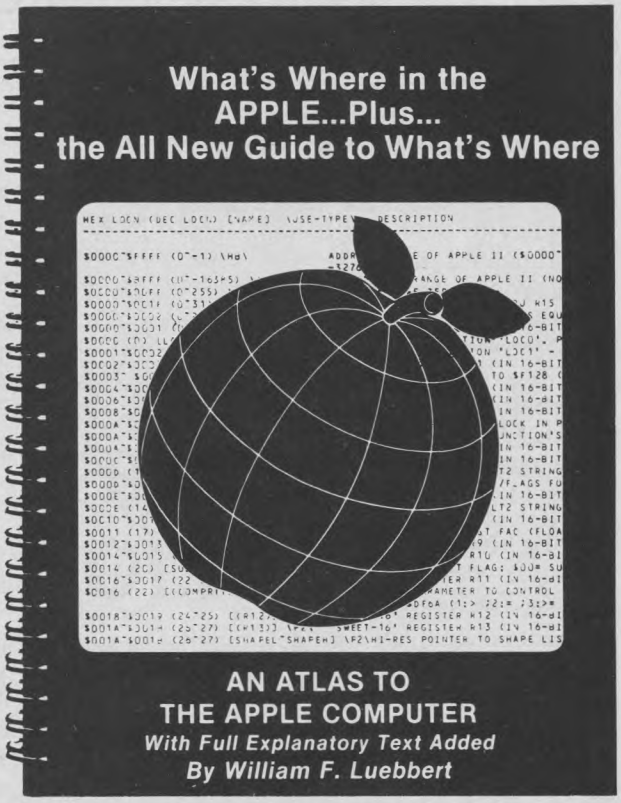

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By Mark J. Robillard

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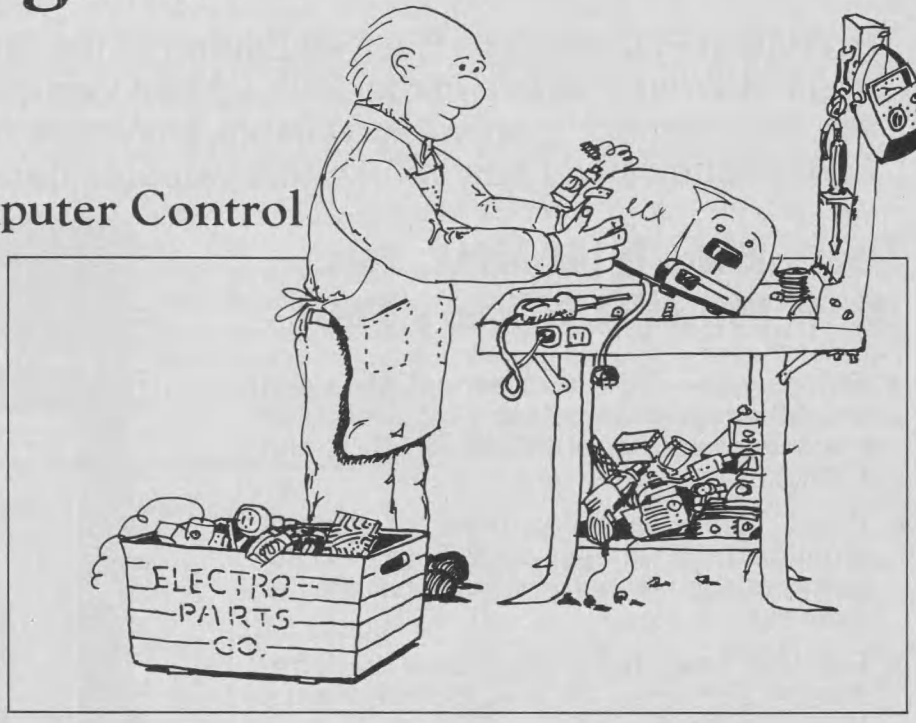

This is the first of a series of articles that will introduce you to the world of intelligent machines. The smart appliances of today will soon grow into personal robots that will be as essential a tool as the pocket calculator. But for the revolution to begin, experimenters must take up the challenge: We built the personal computer industry and we'll be among the first with intelligent homes.

In this series I'll concentrate on personal applications, and you'll be learning by doing. I'll present hardware together with the software necessary to drive the system.

What's an Intelligent Machine? or Does a Toaster Think?

Toasters, as a rule, are not intelligent. On the other hand, a microwave oven is incredibly smart. The new breed of microprocessor-based appliances are intelligent machines. The stereo that turns itself on to record a music program and the refrigerator that tells you when it's defrosting are examples. If micros are what it's all about, then what's so different about these articles?

Today's personal computers are really small software development systems, not sophisticated control centers. If you have to load a floppy disk into your machine to make it do anything, then the machine is not suited for home control. I'm talking about dedicated control computers, each preprogrammed to be expert at each task. If a power outage occurs, your home control system doesn't go south.

Address correspondence to Mark J. Robillard, 3 Peach Lane, Townsend, MA 01469.

About halfway through the series your house will greet you, in whatever language you choose, when you enter, and guard your possessions when you leave. The house will know and be able to report instantly all financial transactions, medical information, energy use or environmental status. If you now live alone, be prepared to accept an intelligent companion.

Home Control

I've been doing a lot of talking about the home. Let's investigate its control possibilities. Enter the kitchen (see Fig. 1). There are two major appliances here that could be monitored. The refrigerator losing its cool could spell disaster—but your personal butler would warn of any problem. The same holds true for your gas range; you might want to know if the pilot goes out before your house unexpectedly remodels itself.

Cooking time and temperature control of the type used in microwave ovens can be added to existing ranges. The kitchen master computer would choose the correct settings from a table in software when you entered the word "roast" on its keypad.

Meal planning and household food inventory are best done with the kitchen computer. Here the machine could be equipped with bar code input wands to read product codes off the packaged food.

A small CRT shows this week's tentative meal schedule; at the push of a button the day's shopping list is entered into your pocket terminal, which you take to the store. This small version of the kitchen system is intelligent enough to check off shopping list items, record the prices paid and help with planning your day (more on this later).

Could the kitchen have more? You bet! (See Fig. 2.) The CRT terminal in the wall can be switched to display the kids playing out back, or an "area scan" radar-like graphic array can show where they have run off to now. This terminal would employ

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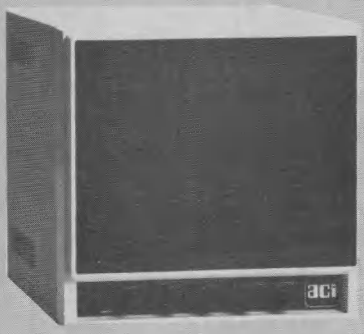

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touch input technology, which would eliminate the need for a separate keyboard. All communication with the kitchen controller would be with voice or CRT touch entry.

A New Use for a Hallway

The home environmental/security status panel (see Fig. 3) will brighten up the hallway. This panel consists of a floor plan of the house. Each room area should be capable of displaying information. The environmental statistics monitored could be inside/outside temperatures, wind direction, weather status and possibly utility status. It could monitor your water supply lines and warn if they are near freezing or if your hot water heater is failing (something I could have used last winter).

Of course the panel would allow you to enter temperature control information, like settings for different times and days of the week. This program may be viewed and edited at any time, and would be available over the phone to a small terminal you would take with you on vacation. The technology already exists.

The security aspects of the hall panel go beyond the sensing of win-

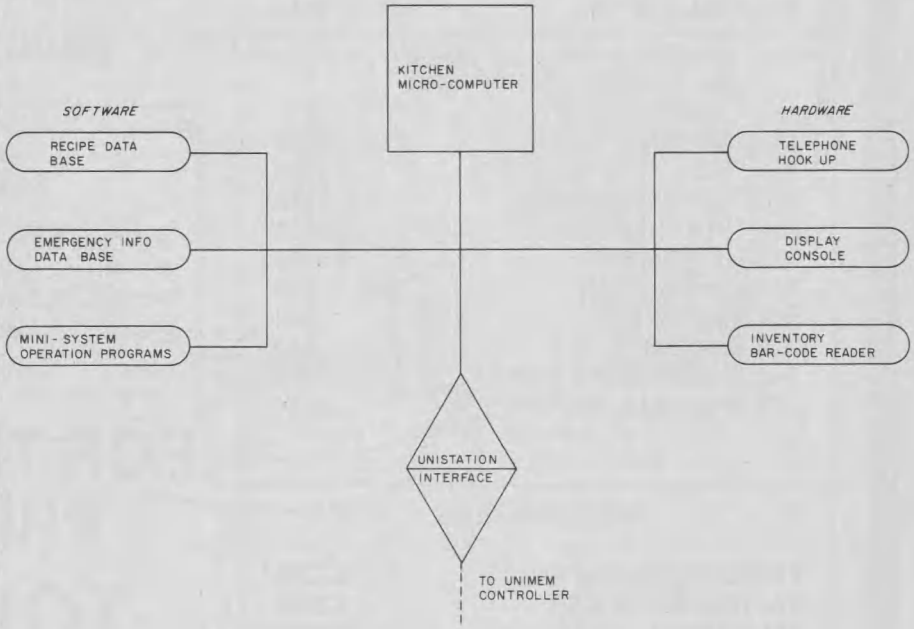

Fig. 1. Block diagram of kitchen controller system. All devices are contained within the kitchen system. Communication with the UNIMEM system is handled through the Unistation tone link.

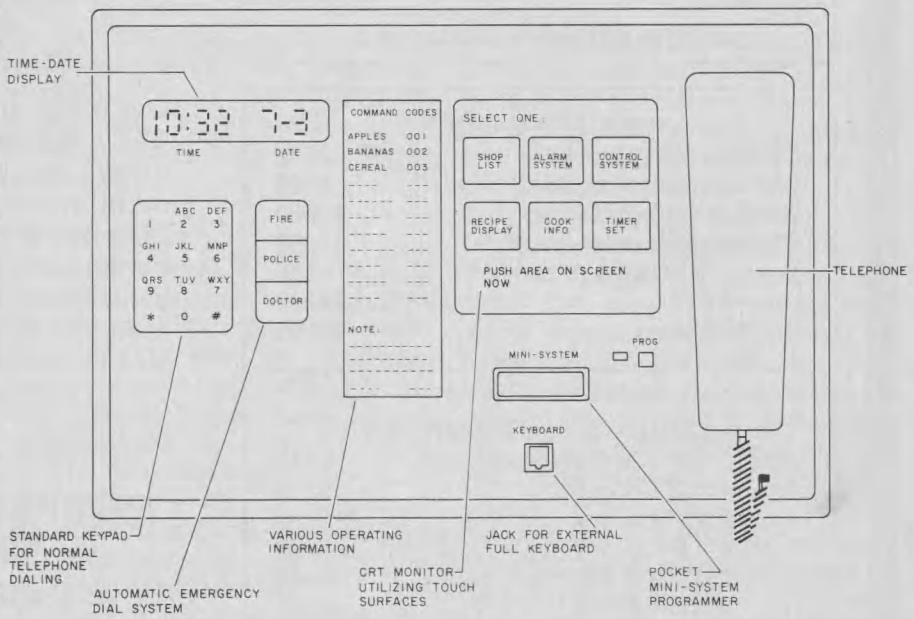

Fig. 2. Rendering of proposed kitchen control center panel. Touch-sensitive CRT and various controls are shown.

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dow switches (Fig. 4). Here your system monitors every room of the house, counting people and telling you where everybody is.

Outside, you would have two perimeters described around the property. When violated, the first (being the outermost) alerts the hall panel that a possible intrusion might occur. At this time no alarm is given to you, the occupant. The computer simply steps up security measures and scans the innermost perimeter more thoroughly.

Being attached to the phone line allows the system to dial the proper authorities and leave an emergency message. It also could call you if you were away at the time. Both fire and intrusion detection are handled by the same control circuitry. This kind of distributed control, where each function is handled by a separate expert computer, is the easiest to implement. Rooms can be added as time and finances allow. Interwiring between rooms would be minimal or nonexistent.

Living Room Activities Center

In many families the living room is the center of most indoor activities. Some use the family room, so I'll consider these the same. The typical liv-

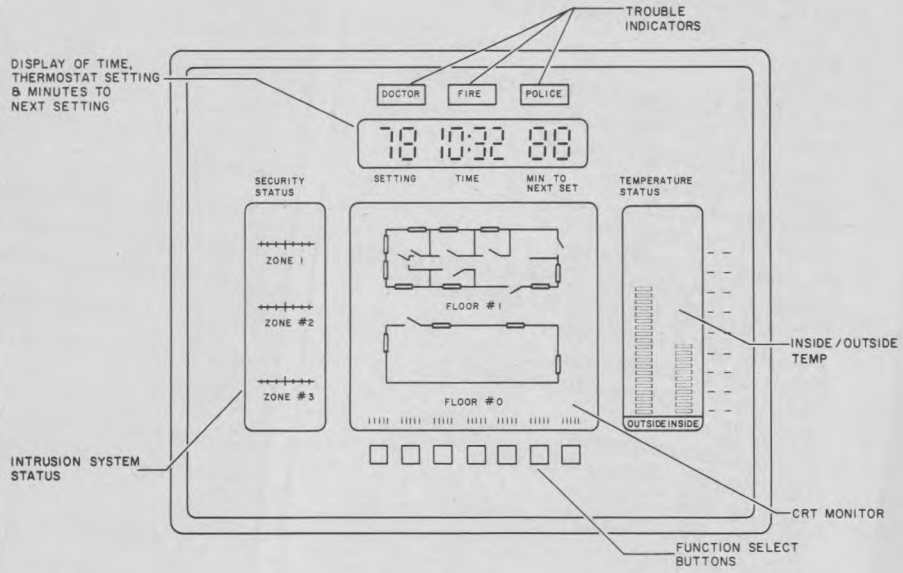

Fig. 3. Environmental/security status panel mounted in hallway displays temperature, wind direction and speed, thermostat setting and security information of all rooms and perimeter of home.

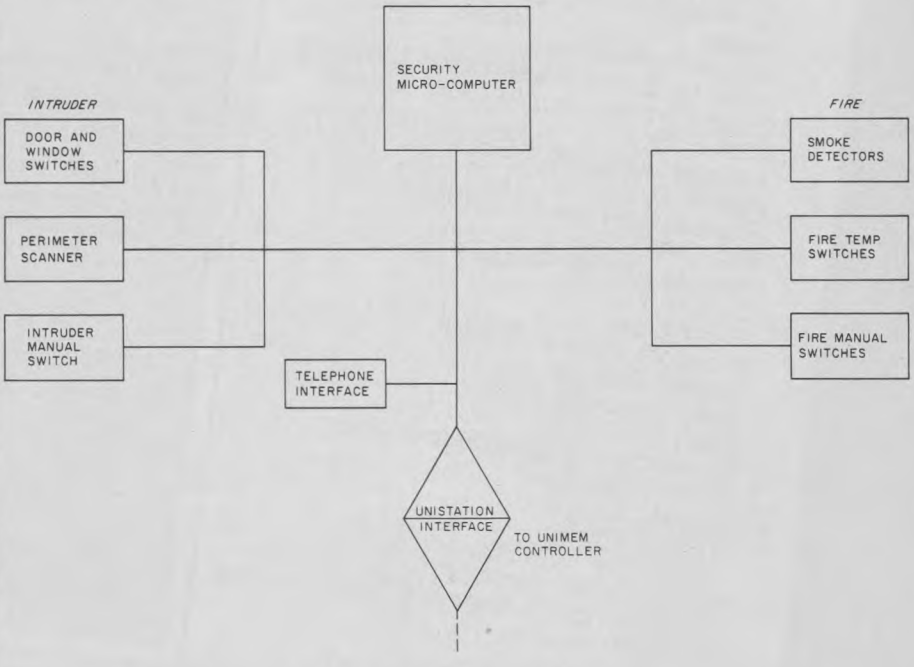

Fig. 4. Security system block diagram.

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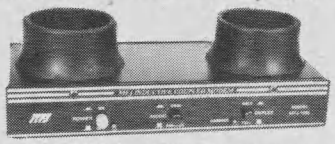

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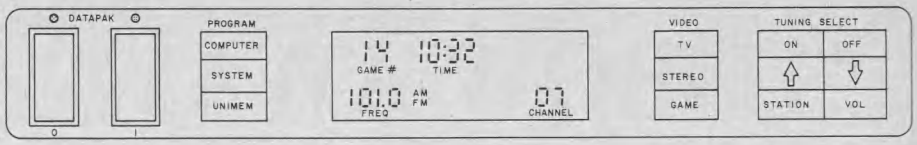

Fig. 5. Living center entertainment/control system.

ing or family room holds various entertainment devices such as TV, stereo and (most recently) the video game. There are plenty of opportunities to computerize or centralize the control of these (see Fig. 5).

Imagine, if you will, one hand-held remote control device that works for all the entertainment devices (see Fig. 6). You can select which Atari game you want to play simply by entering the number on your controller. Video switching between antenna and game is automatic and the joysticks are remote without wires.

Various activities around the house may be monitored from this control center. You could balance your bank accounts and keep your home records here. A Datapak solid state memory module would fill your mass storage requirements. This small matchbox-sized package can store data up to five years, and the data is instantly accessed when you insert the module into a Datapak receptacle in one of the key locations around the house. When used with the pocket mini described during our tour through the kitchen, it eliminates the need for note paper.

Word processing for letter correspondence and personal computing is also accomplished in the living center, because the same Apple or

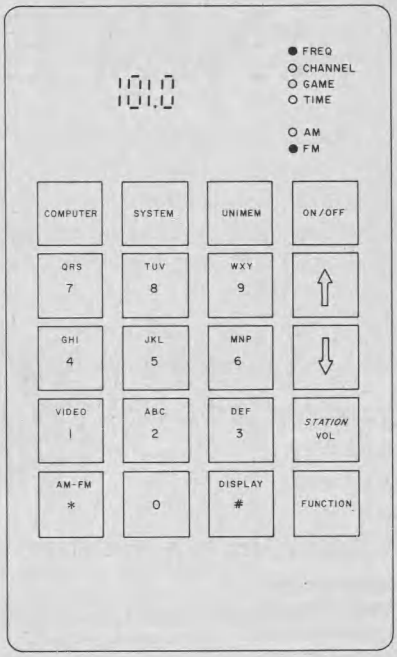

Fig. 6. View of hand-held living center remote controller. Communication between it and the controller is via infrared rays.

TRS-80 that you use is the controller for the system. In upcoming articles I'll describe this entire system with hardware and software for the various home computers.

The cleaning of this and the other rooms of the house is done with work robots (Fig. 7). These are squat cir-

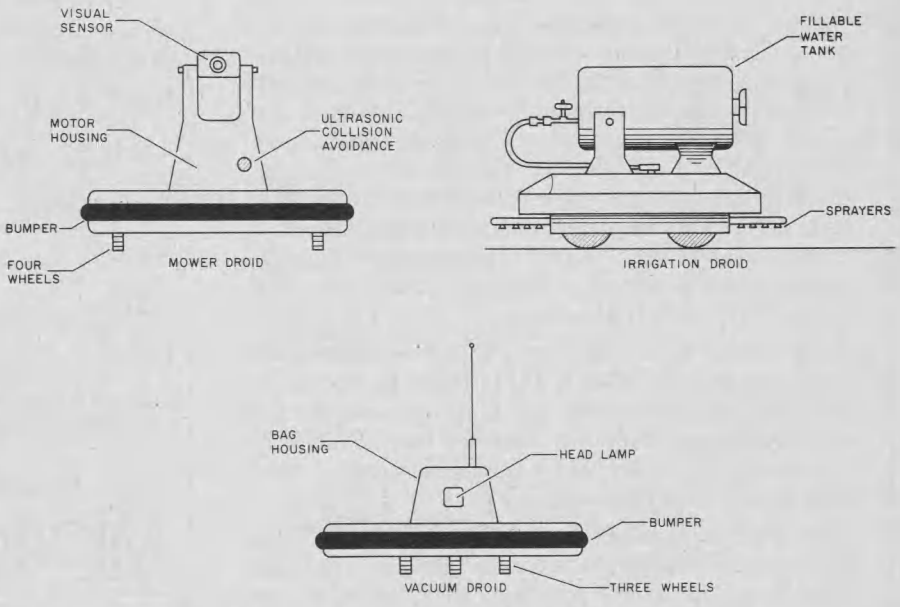

Fig. 7. Rendering of the various work robots proposed for the system.

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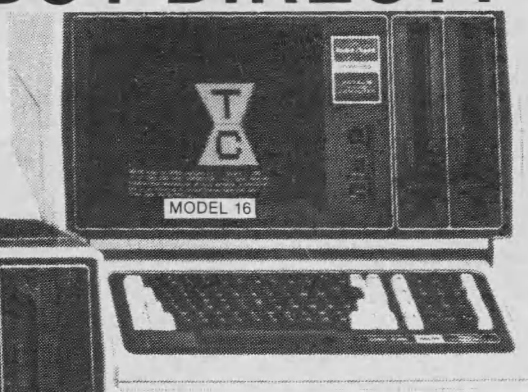

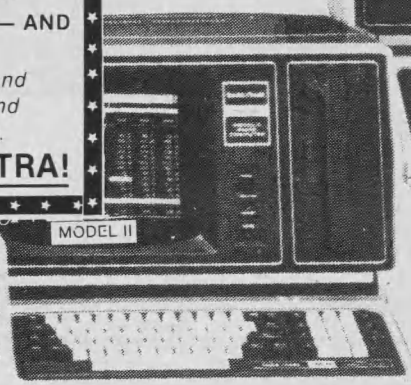

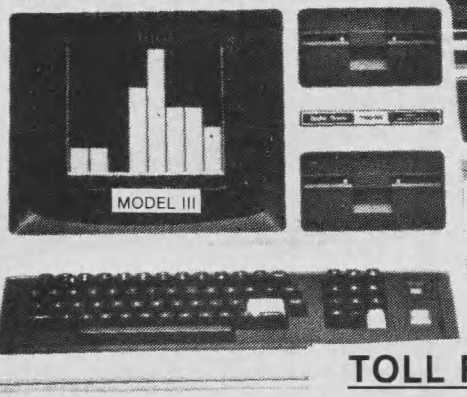

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cular machines designed to either wash or vacuum a floor. They work primarily at night but may be programmed to clean during the daylight hours. The central computer for the house, which I call UNIMEM, controls these robots.

Undisturbed Sleep

The bedrooms of this future home are equipped with a dedicated dwelling contoller which performs all the functions of a nursemaid. Simply telling it to turn out the lights will accomplish what so many people end up groping for before bed. You could order up soft music or whatever turns you on or off, as the case may be.

The system provides alarm functions, as well as a selective call screening service for the wee hours (Fig. 8). If someone wants to leave a message with you, it will be stored either in voice or text format for your listening/viewing pleasure the next morning. A schedule of the day's events and a reminder of medical or other appointments greets you daily.

Nice house, huh? Get excited because we are going to accomplish most of those ideas. Each article will present a piece of the system, and each piece can stand alone if you want to skip some part of the unit.

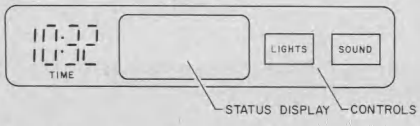

Fig. 8. View of the bedroom control panel. Most information is entered or retrieved via voice.

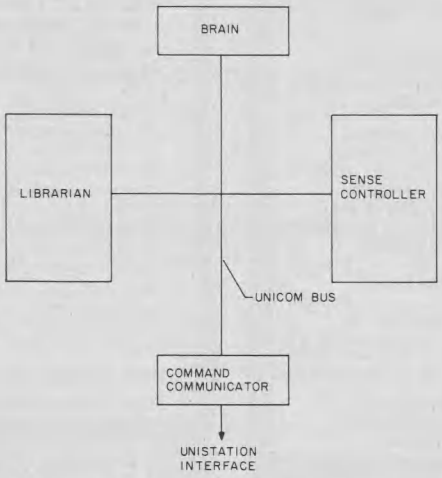

Fig. 9. Block diagram of the UNIMEM control system.

UNIMEM—Master of Control

The UNIMEM computer unit serves as a master overseer of all the distributed computer functions, and controls important house information and utilities. UNIMEM is always on, watching over the flock.

Let's get into the architecture of the UNIMEM system to see how it interacts. A block diagram of the structure is shown in Fig. 9. Examine each block, starting with the command communicator module. The main duties and functions of this unit are the following:

- Performs communication handshaking between functional systems
- Provides man-machine interaction through voice and tone keypad entry
- Acts as the eyes-ears-voice of UNIMEM

Communication between units within UNIMEM is provided via a parallel arrangement called the UNICOM bus. Here every unit communicates as a slave to the brain. The bus structure consists of the signals shown in Table 1.

Communication between units starts with an interrupt originating from the calling party to the brain. The brain, upon recognizing the call, inquires as to the nature of the call. If it is simply the passing of information from the communicator to the librarian, the brain will do a store-and-forward operation. For other cases such as information recall or control operations, the brain will take over communications.

In most instances the brain unit is not processing data. Each expert system does what it can to handle the day-to-day chores. The external computers for the kitchen, entertainment and environmental/security control all interface to the Command Communicator through a tone-contolled link. These tones are standard touch-tone signals made up of the same frequencies as those used in the telephone system.

The individual systems act as remote input stations connected to UNIMEM and are used to relay messages from UNIMEM to you.

Librarian

What good is a home control center without a good library? This one keeps both permanent and temporary records of everything. Birth certificates, insurance policies and automobile service information are a few

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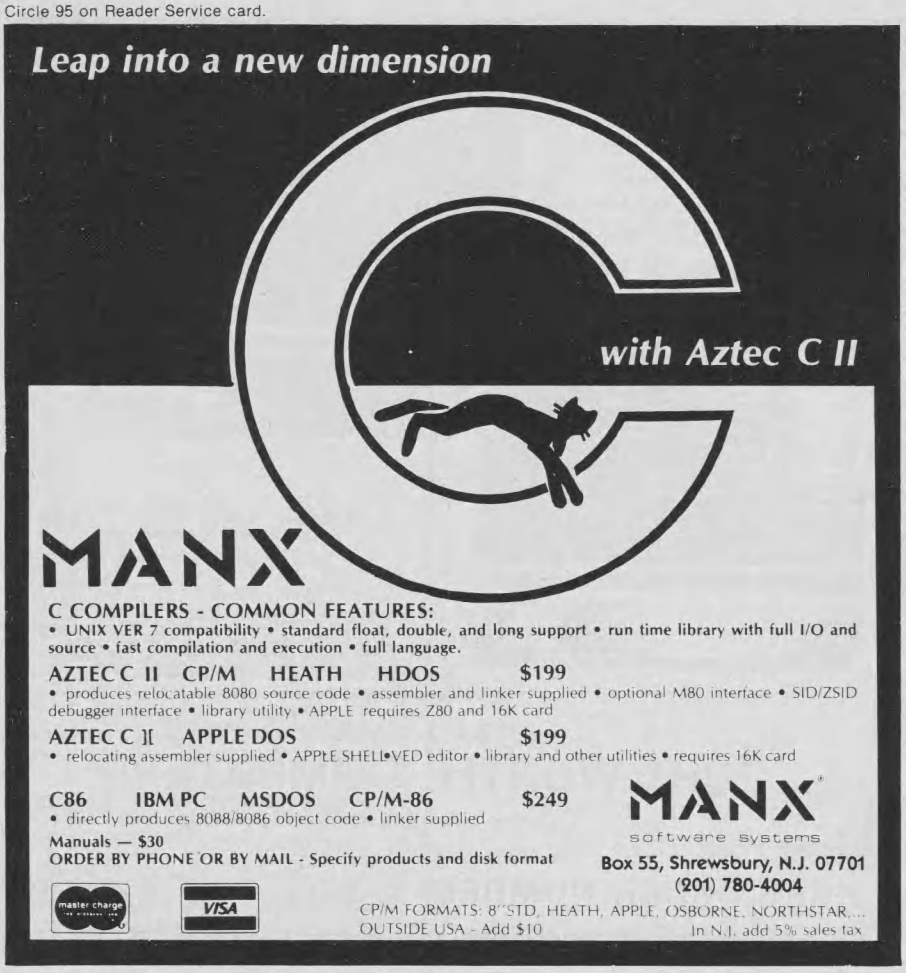
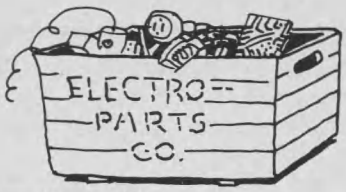


of the permanent types of data. Events, such as medical appointments, and current clothing sizes of all residents exemplify the type of temporary data stored.

This data is remembered in different ways. Permanent data is blown into EPROM; temporary info is held in battery-backed-up RAM. Large amounts of data can be stored off line on magnetic tapes or disks. But the rule is that if it needs to be instantly accessible, it cannot be on mass tape storage.



Sense Controller

I have discussed the eyes-ears-mouth and brain with associated memory bank, and it's time to discuss muscle. I/O control for the house is fully distributed: Cooking chores are handled by the kitchen controller; security and environmental control has its associated controller; even the bedrooms have separate controllers. So what does the sense controller do?

Remember the robot vacuum cleaner? This, along with a host of lawn mowers, irrigation droids, etc., is commanded via this unit. This controller also monitors electricity use, water consumption and other important utility items. It dispatches the work robots when needed. The irrigation droid, for instance, senses soil moisture around the house; when it's dry, out comes the water boy.

Well, that's the controller in a nutshell. In the coming months I'll be refining these design standards and constructing the systems. The living center will be based entirely on personal computer I/O, and I will include listings for all the popular micros. The kitchen and security systems will employ single chip microcomputers which you will learn about along the way.

Next month I will start off by designing and constructing an ears-and-mouth subsystem. This interface will recognize voice signals and enunciate any message.■

Data 0-7	— 8-bit bidirectional data bus
C/D	— control/data status command
PWR	— +5 V logic power
GND	— system ground
WR	— write enable signal
RD	— read enable signal
AUDIO	— analog audio signal
PWR 1	— battery power for nonvolatile librarian storage
INT	— interrupt to brain
COM	— command communicator enable signal
LIB	— librarian enable signal
SENSE	— sense controller enable signal

Table 1. Bus structure consists of these signals.

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Plotting with the Microline 80

The Microline 80 block graphic characters make curve plotting easy. This Basic program shows you how.

By Donald Galler

Many microprocessor-based printers have special features that can be used for graphics or plotting. The Okidata Microline 80 dot matrix line printer, based on the Intel 8048 chip, prints at five, ten or 16.5 characters per inch and either six or eight lines per inch. These parameters can be selected under program control by special character sequences. The Microline 80 can also print 64 special block graphic characters, as well as all the characters represented by seven-bit ASCII codes. The program shown in the listing uses the block graphic characters to plot curves with 20-element-per-inch resolution.

Microline 80 Block Graphics

Fig. 1 shows the format of Microline 80 graphic characters. Standard alphanumeric characters are printed using a seven-dots-high by nine-dots-wide matrix, while graphic characters are printed using a 12 by 6 matrix. Since the Microline 80 uses a seven-wire print head, it prints graphic characters in two passes under internal microprocessor control.

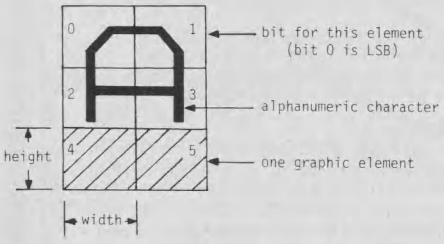

Fig. 1. Format of Microline 80 graphic characters.

The graphic characters are broken into six blocks, or elements, each four dots high and three dots wide. These characters are selected by setting the MSB (bit 7) of the ASCII character code to a 1; this differentiates alphanumeric characters from graphic characters. The remaining bits are used as follows: bits 0–5 select one of the 64 possible graphic characters, bit 6 is ignored. If one of the six low-order bits is a 1, then the corresponding element (as numbered in Fig. 1) will be printed. These elements are the smallest entities that can be printed anywhere on an output page under software control.

Graphic Print Element Dimensions

chars per inch \ lines per inch	6	8
5	$\frac{1}{10}\times\frac{1}{18}$	$\frac{1}{10}\times\frac{1}{24}$
10	$\frac{1}{20}\times\frac{1}{18}$	$\frac{1}{20}\times\frac{1}{24}$
16.5	$\frac{1}{33}\times\frac{1}{18}$	$\frac{1}{33}\times\frac{1}{24}$

Dimensions are width × height (inches)

Table 1. Dimensions of graphic print element for different line and character spacings.

Before designing the plotting program, decide which character width and line spacing will give the best graphic element dimensions. Table 1 shows all of the possible element dimensions. To get an almost square element, I chose 10 cpi and 6 lpi. The resulting element size, 1/18 inch high and 1/20 inch wide, gives a plotting resolution of about 20 elements per inch (18 per inch vertically and 20 per inch horizontally). This is two or three times better than plotting with characters using 10 cpi and 6 lpi.

Constructing Axes and Curves

Since the Microline 80 can print on 8½- by 11-inch paper, I arranged the x and y axes to produce plots on this size paper. The format of the plots is shown in Fig. 2.

The x axis is vertical (along the 11-inch side) while the y axis is horizontal (along the 8 1/2-inch side). The y axis consists of a single row, 50 characters (100 elements) long, with extra elements printed every five spaces for tick marks.

The x axis consists of two columns (each 50 characters (150 elements) long), so that two different types of tick marks (5 units, 10 units) can be printed, as with the y axis. Complete each axis by adding one additional character, which allows the last tick mark to be printed.

The curve is plotted in the area shown in Fig. 2 and is bounded by the x and y axes. The plot area is 100 times 1/20 or 5 inches wide (along the y axis) and 150 times 1/18 or 8.3

Donald Galler is an engineer with Alexander Kusko, Inc. (Consulting Engineers, Needham Heights, MA 02194) and is president of Galler Systems (PO Box 251, Newton, MA 02164), a software consulting group.

inches long (along the x axis). This format allows for the extra space needed to print labels and values along with the axes. The curve is plotted along with the axes by setting the bits corresponding to the y values in each of the 150 rows. In this simple method, the y values are stored in an array and one element is printed in each row of the x axis for each y element.

Plotting Program

A program written in North Star Basic for plotting with the Microline 80 is shown in Listing 1. To accommodate the inevitable modification of the program, it is organized as a main program and five subroutines. In the present form of the program, each of the subroutines is called only once. The function of each of the subroutines is as follows:

1. Read data file and initialize arrays	(line 1000)
2. Construct x axis	(line 2000)
3. Construct y axis	(line 3000)
4. Construct graph	(line 4000)
5. Print axes and graph	(line 5000)

The first subroutine prompts the filename from the console (device #0) and reads the data to be plotted on the printer (device #1). If the file is not found at that point, a warning message is issued and the program terminates. If the file is found, it is read and the plotting is performed. The data file is structured as shown below:

1. Number of y values	(N, 150 max)
2. y values	(N of these)
3. lowest x value	
4. highest x value	
5. lowest y value	
6. highest y value	
7. x axis label	(20 chars. max)
8. y axis label	(20 chars. max)
9. Title of plot	(40 chars. max)

After the data is read, the 2500-character string that holds the 50 by 50 character plot area is initialized. This is necessary even though North Star Basic initializes character strings to blanks because a graphic blank for the Microline 80 is hex 80, not hex 20. The x and y axes are constructed by first initializing the 51-character strings, and then counting through the positions that need to have extra bits set for the tick marks.

Once the axes are constructed, the graph is generated in memory as follows: For each of the N data values, a number (0, 2 or 4) is generated from the do loop index I (line 4010) and the y value is used to generate a second number which represents the "oddness" of the element to be set. This number is a 1 if the element number is 1, 3 or 5, and it is 0 otherwise. A character location is also generated at this point. The graphic element is made by raising 2 to the sum of the two numbers just computed and adding the result to the character at the

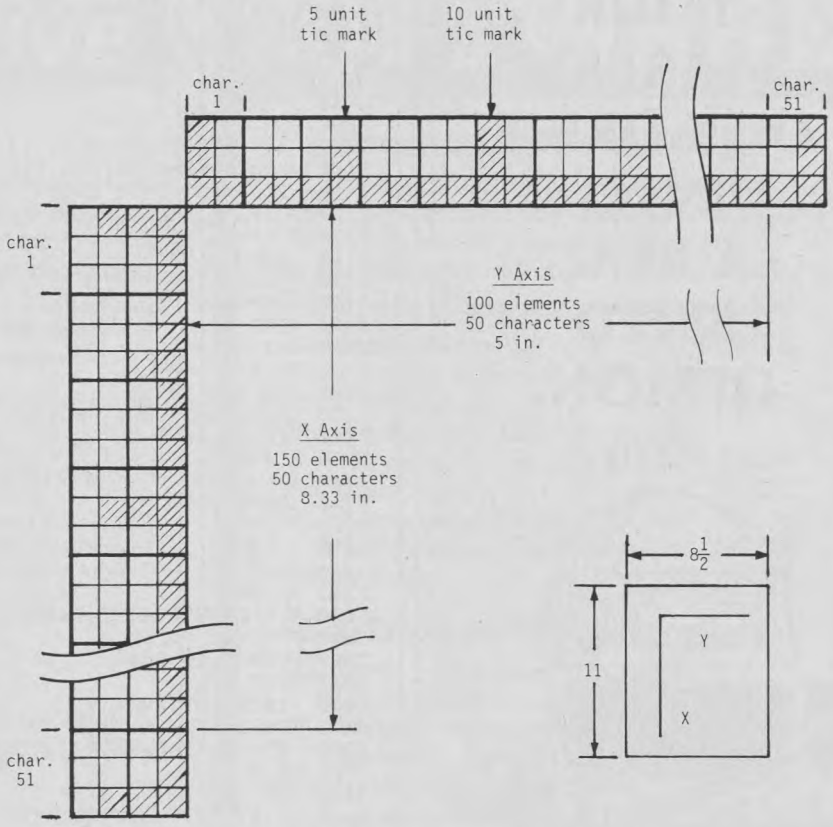

Fig. 2. Axes construction and graph format for Microline 80 plotting program.

Program listing. North Star Basic program for plotting with the Microline 80.

```
100 REM PLOT PROGRAM FOR MICROLINE 80
110 DIM Y(150),X1$(51),X2$(51),X3$(20),Y1$(51),Y3$(20)
120 DIM P$(2500),F$(50),T$(40)
130 GOSUB 1000
140 IF F=-1 THEN 200
150  GOSUB 2000
160  GOSUB 3000
170  GOSUB 4000
180  GOSUB 5000
190  GOTO 210
200 PRINT #0, "NO FILE FOUND"
210 END
1000 REM READ DATA AND INITIALIZE ARRAYS
1010 INPUT #0, "FILENAME: ",F$
1020 F=FILE(F$)
1030 IF F=-1 THEN 1210
1040  OPEN #0,F$
1050  READ #0,N
1060  FOR I=1 TO N
1070   READ #0,Y(I)
1080  NEXT I
1090  READ #0,X1,X2,Y1,Y2,X3$,Y3$,T$
1100  CLOSE #0
1110  Y3=(Y2-Y1)/100
1120  X3=(X2-X1)/N
1130  A1$=CHR$(128)
1140  A2$=CHR$(130)
1150  A3$=CHR$(144)
1160  A4$=CHR$(170)
1170  A5$=CHR$(176)
1180  FOR I=1 TO 2500
1190   P$(I,I)=A1$
1200  NEXT I
1210 RETURN
```

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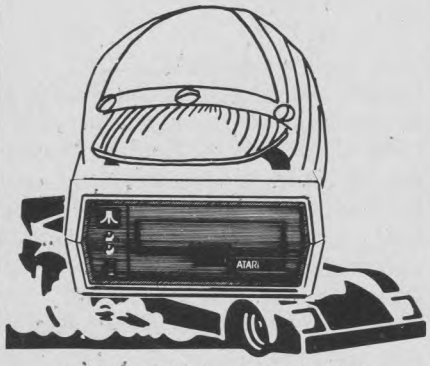

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Listing continued.

```
2000 REM CONSTRUCT X AXIS
2010 FOR I=1 TO 51
2020  X1$(I,I)=A1$
2030  X2$(I,I)=A4$
2040 NEXT I
2050 X2$(51,51)=A2$
2060 K=1
2070 J=2
2080 FOR I=1 TO 16
2090  X1$(K,K)=CHR$(ASC(X1$(K,K))+J)
2100  X2$(K,K)=CHR$(ASC(X2$(K,K))+J/2)
2110  IF J<>32 THEN 2150
2120   J=2
2130   K=K+4
2140  GOTO 2170
2150   J=J*4
2160   K=K+3
2170 NEXT I
2180 K=2
2190 J=16
2200 FOR I=1 TO 15
2210  X2$(K,K)=CHR$(ASC(X2$(K,K))+J)
2220  IF J<>16 THEN 2260
2230   J=1
2240   K=K+4
2250  GOTO 2280
2260   J=J*4
2270   K=K+3
2280 NEXT I
2290 RETURN
3000 REM CONSTRUCT Y AXIS
3010 FOR I=1 TO 50
3020  Y1$(I,I)=A5$
3030 NEXT I
3040 Y1$(51,51)=A3$
3050 FOR I=1 TO 51 STEP 5
3060  Y1$(I,I)=CHR$(ASC(Y1$(I,I))+5)
3070 NEXT I
3080 FOR I=3 TO 48 STEP 5
3090  Y1$(I,I)=CHR$(ASC(Y1$(I,I))+8)
3100 NEXT I
3110 RETURN
4000 REM CONSTRUCT GRAPH
4010 FOR I=1 TO N
4020  I1=I-1
4030  I2=INT(I1/3)+1
4040  I3=(I1-(I2-1)*3)*2
4050  J=INT((Y(I)-Y1)/Y3+.5)
4060 IF J<1 THEN J=1
4070 IF J>99 THEN J=99
4080  J1=J-1
4090  J2=INT(J1/2)+1
4100  J3=J1-(J2-1)*2
4110  K=(I2-1)*50 +J2
4120  L=2^(I3+J3)
4130  P$(K,K)=CHR$(ASC(P$(K,K))+L)
4140 NEXT I
4150 RETURN
5000 REM PRINT GRAPH
5010 PRINT #1, CHR$(31)
5020 PRINT #1, TAB((40-LEN(T$))/2),T$
5030 PRINT #1
5040 PRINT #1, CHR$(30),TAB(40-LEN(Y3$)/2),Y3$
5050 PRINT #1, %3I,TAB(14),Y1,TAB(39),Y1+50*Y3,
5060 PRINT #1, TAB(64),Y1+100*Y3
5070 PRINT #1, TAB(15),Y1$(1)
5080 FOR I=1 TO 50
5090  I1=50*(I-1)+1
5100  I2=50*I
5110  FOR K=I2 TO I1 STEP -1
5120   IF P$(K,K)<>A1$ THEN K=-K
5130  NEXT K
5140 IF K>0 THEN I2=1+K ELSE I2=-1-K
5150  IF X1$(I,I)=A2$ THEN PRINT #1, TAB(5),X1+X3*3*(I-1),
5160  PRINT #1, TAB(13),X1$(I,I),X2$(I,I),P$(I1,I2)
5170 NEXT I
5180 PRINT #1, TAB(5),X1+X3*150,TAB(13),X1$(51,51),X2$(51,51)
5190 PRINT #1
5200 PRINT #1, TAB(13-LEN(X3$)/2),X3$
5210 RETURN
```

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current location. This procedure gives the bit for the element an "or" relationship with the existing bits.

With the axes and graph constructed, the title is printed, using the Microline's large character size, followed by the y axis label and the y axis itself. The graph is printed one line at a time so that a piece of the x axis and a row of the graph are printed on the same line. The x and y axes labels are centered in the ordinary way and some of the x axis values are printed as well. A sample of the output is shown in Fig. 3.

Room for Improvement

The sample run shows that the program can generate medium resolution (20 elements per inch) graphs using the Microline 80 special graphic characters.

To make the program more suitable for general-purpose plotting, the following features should be added:

- Plotting more than one set of data on one graph
- Automatic scaling of the y values
- Automatic sorting of data according to x values

These features, in conjunction with the program shown here, represent a general-purpose plotting package that will generate medium resolution plots using the special features of the Microline 80 line printer.■

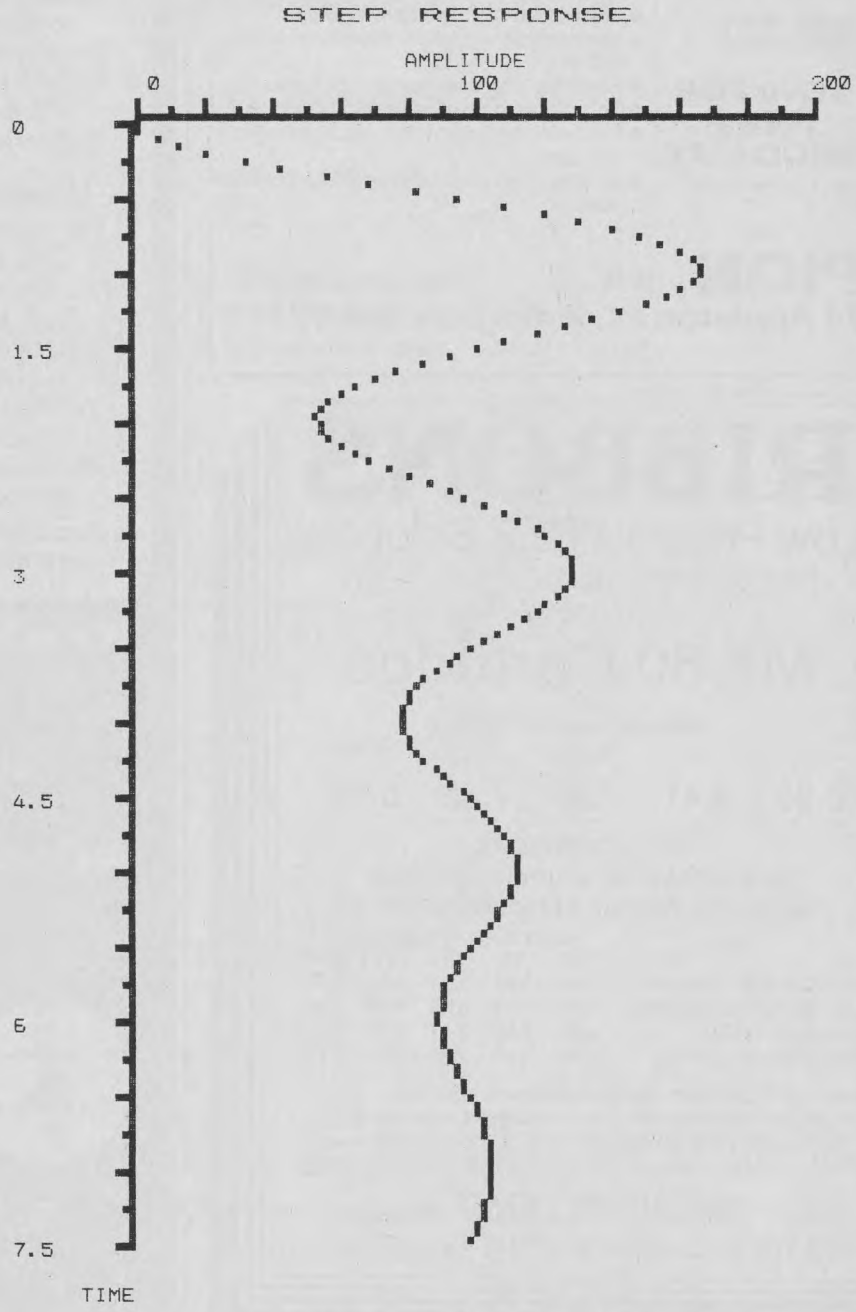

Fig. 3. Sample of output produced by Microline 80 plotting program.

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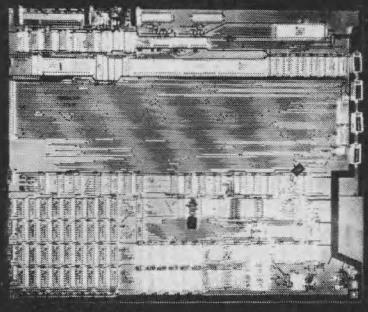

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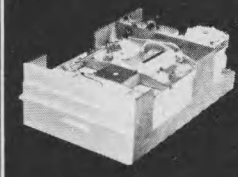

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Circle 133 on Reader Service card.

Apple's Magic VisiCalc Formulas

This program to print VisiCalc formulas leads you on an adventure in string manipulation in Apple III Business Basic.

By Justin Crom

VisiCalc is a fantastic tool for business planners. It enables analysts to quickly examine "what-if" scenarios without requiring a degree in computer science to perform the modeling; however, this tool does have some disadvantages. One cited often by planners who are accustomed to modeling on mainframes is the inability to print out the formulas in effect. The only method of formula determination available with VisiCalc is loading the model and scanning it cell-by-cell.

This problem bothered me too. On several occasions I've created models that I would like to discuss with others, but have found that sitting side by side with another planner in a darkened room and peering at a green screen was not much fun. Software packages are available for the Apple II that will extract the formulas from a stored VisiCalc model, but I'm not aware of a similar product for the Apple III.

Storage Method

When a VisiCalc model is saved on disk, VisiCalc creates a text file starting with the lower right corner cell of the model. Table 1 shows the output of a simple VisiCalc model. Table 2 shows the way the same model is stored on disk: the cell contents are prefaced with a > sign followed by the cell coordinates and a colon. Cells are written on the disk in right-to-left order, bottom row first and moving upward. If a VisiCalc cell is blank, nothing is stored.

After all cells have been stored, VisiCalc then writes whatever global options were in effect for the cell. The last information placed on disk by VisiCalc is the cursor position at the time the model was saved. While a copy of this text file contains all the information required to reproduce the model with a computer, it is not easy for a human to decipher.

To render the stored VisiCalc model readable, all you have to do is read the information into a program that will reformat it to look like the VisiCalc screen, with the *formulas* showing in the cells instead of the values. Sounds easy, doesn't it?

Approaches to the Solution

My first attempt at a solution yielded an Apple III Business Basic program based on reading all stored cells into a string array. The information was then printed in a row and column format, starting in the upper left corner of the model. This approach worked fine with small VisiCalc models (40 rows×12 columns), but bombed due to lack of memory when used with a more typical business model.

After searching in vain for an elegant algorithm, I opted for the sledgehammer approach. A printout of a VisiCalc spreadsheet can be thought of as a series of vertical "stripes," with the width of each stripe determining the number of VisiCalc columns that will fit a sheet of paper. With my printer, 12 columns seemed appropriate. The length of the stripe depends on the number of rows in the VisiCalc model (254 maximum).

The VisiCalc model is read once for each stripe required to print out the model, and only that information needed to complete the stripe is stored in the string array. While this method involves numerous disk accesses on a large model, it works. A sample of the output is shown in Table 3.

String Handling

Apple III Business Basic provides some powerful tools for manipulating string data. Here's how I used them:

The For...Next loop shown in lines 140 through 270 in Listing 1 reads each block of cell information from the VisiCalc model, checks to see if the cell is within the range of columns to be printed for the current stripe, and discards unwanted data. Data within the desired range is stored into a string array.

Line 165 checks the first element of the data. If it is a slash instead of a > sign, the end of the cell contents has been reached and the global options block is being read. The program

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Table 1. Sample VisiCalc file.

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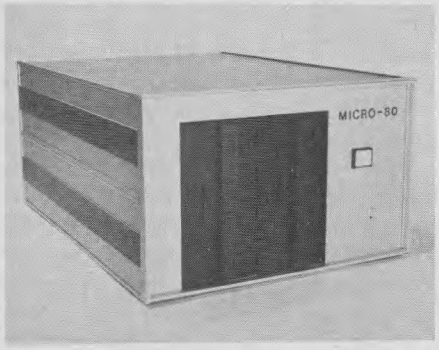

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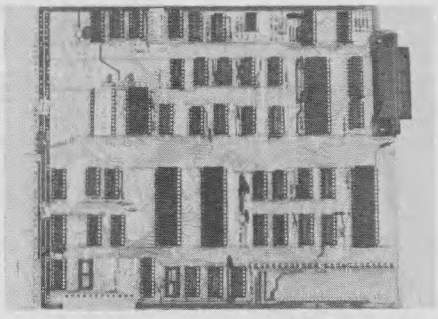

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```
>H10:@SUM(D10...F10)>F10:+F8*F7>E10:+E8*E7>D10:+D8*D7>B10:"A
LE>A10:"  TOTAL S>H9:" -------->F9:" -------->E9:" --------
>D9:" --------
>H8:/FI@SUM(D8...F8)>G8:/FI>F8:/FI4>E8:/FI3>D8:/FI5>B8:"
100'S>A8:"QUANTITY,>F7:2.6>E7:6>D7:3>A7:"PRICE/100>H5:" ----
---->F5:" -------->E5:" -------->D5:" --------
>H4:/FR"TOTAL>F4:/FR"WASHERS>E4:/FR"BOLTS>D4:/FR"NUTS>B4:"IT
EM:>G2:"-->F2:"---------->E2:"---------->G1:"LE>F1:"SICALC
FI>E1:"SAMPLE VI>A1:"7/25/82/W1/GOC/GRA/GF$/GC9/X>A1:>A10:
```

Table 2. Disk format of VisiCalc model shown in Table 1.

```
VisiCalc model: .d1/sample.vis
Global options in effect:
    GOC GRA GF$ GC9

          A       B       C       D       E       F       G       H       I       J       K       L

 1 7/25/82                          SAMPLE VI SICALC FI LE
 1
 2                                  --------- --------- --
 2
 3
 4          ITEM:                 /FR"NUTS  /FR"BOLTS /FR"WASHE          /FR"TOTAL
 4                                                    RS
 5                                 --------  --------  --------          --------
 5
 6
 7 PRICE/100                      3         6         2.6
 7
 8 QUANTITY,  100'S               /FI5      /FI3      /FI4      /FI     /FI@SUM(D
 8                                                                      8...F8)
 9                                 --------  --------  --------          --------
 9
10  TOTAL S ALE                   +D8*D7    +E8*E7    +F8*F7            @SUM(D10.
10                                                                      ..F10)
```

Table 3. Sample output of VisiCalc formulas.

Listing 1. Apple III Business Basic program to output VisiCalc formulas.

```
10    REM ************************
20    REM * program to print out *
30    REM *  VisiCalc formulas   *
32    REM *                      *
34    REM * author: Justin Crom  *
36    REM *                      *
40    REM ************************
100    HOME
108    bcol=1:ecol=12:REM bcol is beginning column ecol is the stripe width
110    PRINT"Enter name of VisiCalc file"
112    INPUT a$
114    OPEN#2,".d1/name"
115    PRINT#2:a$
116    PRINT#2:bcol
117    PRINT#2:ecol
118    CLOSE#2
122    CLEAR:REM                              cleans up memory
123    DIM cell$(254,12),k(254),col$(12)
124    OPEN#2,".d1/name"
126    INPUT#2:a$,bcol,ecol
128    CLOSE#2
130    OPEN#1 AS INPUT,a$
135    ON EOF#1 GOTO 1600
136    REM ******************************************************
137    REM * Read VisiCalc file keeping only the cells that are *
138    REM * within the stripe to be printed                    *
139    REM ******************************************************
140    FOR i=1 TO 16002
145      IF(((i/100-INT(i/100))*100)=0) THEN x= FRE:REM cleanup memory
150      INPUT#1:v$
165      IF(LEFT$(v$,1)="/") THEN GOTO 1500:REM check for slash
170      v$=MID$(v$,2):REM chop off > sign
180      l=INSTR(v$,":"):REM find colon
190      ind$=LEFT$(v$,(l-1)):REM left half is index to coordinates
192      REM
195      REM ***********************************************
200      REM break down the index into col and row numbers
205      REM ***********************************************
206      REM
210      s$=LEFT$(MID$(ind$,2),1):REM pick off second element in coord string
220      s=ASC(s$)
225      REM
226      REM ******************************************************
227      REM check second element and convert coordinates to numbers
228      REM ******************************************************
229      REM
230      IF(s<65) THEN col=ASC(LEFT$(ind$,1))-64:row=VAL(MID$(ind$,2)):GOTO 252
240      col=(ASC(LEFT$(ind$,1))-64)*26+s-64
250      row=VAL(MID$(ind$,3))
251      REM
```

More →

then branches to line 1500.

Line 170 removes the first element of the string. MID$ returns a substring starting at the value given by the second parameter. Since no third parameter was included to tell MID$ where to stop, all elements from position 2 to the end are returned.

Line 180 finds the location of the colon within the cell data. Line 190 divides the cell data at the colon location: the left half contains the cell coordinates or index and the right portion contains the cell format and contents. LEFT$ returns the leftmost characters specified by the second parameter.

Lines 210 through 250 break down the VisiCalc cell index into a form usable as array subscripts. (VisiCalc columns are referenced by letter combinations, A through BK, 63 columns in all.) Line 230 tests the second element of the index to see if it is a letter or a number. If it is a number, the first element of the index is the column letter. If line 230 determines that the second element is a letter, then both the first and second elements describe the column. In either case, the remaining portion of the index after the column descriptor is the row number. The balance of lines 230 through 250 converts the letter-number coordinates of VisiCalc into a row and column number pair.

Line 252 stores the coordinates of the first VisiCalc cell read since it is the highest numbered cell. Lines 254 and 256 determine if the cell is within the "stripe" to be printed on this pass.

The remaining lines of the For... Next loop index a valid cell into the string array CELL$. Line 265 suppresses the leading quotation marks that VisiCalc uses to designate labels.

Once a slash has been detected during a read, program execution branches to line 1500. This section reads in the VisiCalc global parameters and prepares the cells' formulas for printing.

Line 1570 strings the global parameters together with separating spaces. Line 1560 detects the end of the global parameter section by using LEFT$ and MID$. An English translation of line 1560 is: "If the leftmost position of a substring from position 3 of the main string is the > sign, then go to 1600." Examine the last part of Table 2 while contemplating this.

Lines 1700 to 1750 determine the column headers for the stripe to be printed.

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Listing continued.

```
252     IF i=1 THEN nrow=row:ncol=col:REM store highest col and row numbers
254     IF(col<bcol) THEN GOTO 270:REM   check to see if within stripe
256     IF(col>(bcol+11)) THEN GOTO 270
257     REM
258     ico=col-bcol+1:REM                store valid cell contents
260     cell$(row,ico)=MID$(v$,(1+1))
265     IF(ASC(LEFT$(cell$(row,ico),1))=34) THEN cell$(row,ico)=MID$(cell$(row
        ,ico),2)
270     NEXT i
1490    REM ************************
1492    REM    Read global parameters
1494    REM ************************
1500    OPEN#2,".printer"
1510    OUTPUT#2
1540    b$=""
1550    INPUT#1;v$
1560    IF(LEFT$(MID$(v$,3),1)=">") THEN GOTO 1600
1570    b$=b$+" "+MID$(v$,2)
1580    GOTO 1550
1585    REM
1590    REM ************************************************
1592    REM Find number of blocks required to print each cell
1594    REM ************************************************
1596    REM
1600    FOR i=1 TO nrow
1610      k(i)=1
1620      FOR j=1 TO 12
1630        IF(LEN(cell$(i,j))>k(i)) THEN k(i)=LEN(cell$(i,j))
1640        NEXT j
1650      k(i)=INT(k(i)/9+1)
1660      NEXT i
1690    CLOSE#1
1700    FOR i=1 TO ecol
1701      REM ****************************
1702      REM Set column headers for stripe
1703      REM ****************************
1705      j=bcol+i-1
1710      IF(j<27) THEN col$(i)=CHR$(64+j):GOTO 1740
1720      IF(j<53) THEN col$(i)="A"+CHR$(64+j-26):GOTO 1740
1730      col$(i)="B"+CHR$(64+j-52)
1740      NEXT i
1750    GOSUB 9000
1760    REM
1761    REM ***********************************************
1762    REM Divide cells into blocks for each row and print
1763    REM ***********************************************
1764    REM
1800    FOR i=1 TO nrow
1810      FOR m=1 TO k(i)
1820        is=1+(m-1)*9
1830        ie=9
1840        c1$=MID$(cell$(i,1),is,ie)+" "
1850        c2$=MID$(cell$(i,2),is,ie)+" "
1860        c3$=MID$(cell$(i,3),is,ie)+" "
1870        c4$=MID$(cell$(i,4),is,ie)+" "
1880        c5$=MID$(cell$(i,5),is,ie)+" "
1890        c6$=MID$(cell$(i,6),is,ie)+" "
1900        c7$=MID$(cell$(i,7),is,ie)+" "
1910        c8$=MID$(cell$(i,8),is,ie)+" "
1920        c9$=MID$(cell$(i,9),is,ie)+" "
1930        c10$=MID$(cell$(i,10),is,ie)+" "
1940        c11$=MID$(cell$(i,11),is,ie)+" "
1950        c12$=MID$(cell$(i,12),is,ie)+" "
1960        PRINT USING 1970;i,c1$,c2$,c3$,c4$,c5$,c6$,c7$,c8$,c9$,c10$,c11$,c1
            2$
1970        IMAGE###,x,10A,10A,10A,10A,10A,10A,10A,10A,10A,10A,10A,10A
1980        nl=nl+1
1990        IF(nl>60) THEN GOSUB 9000
2000        NEXT m
2010      NEXT i
2011    REM
2012    REM ***************
2013    REM Stripe completed
2014    REM ***************
2015    REM
2020    bcol=bcol+12
2024    IF(bcol>ncol) THEN GOTO 6000:REM   escape loop if highest cell printed
2030    IF(bcol>50) THEN ecol=3:REM        set indicator for last three columns
2840    GOTO 114
6000    CLOSE#2
6005    PRINT FRE
6010    END
7008    REM
7009    REM ********************
7010    REM Page header section
7011    REM ********************
7012    REM
9000    PRINT CHR$(12);CHR$(5);CHR$(2):REM    Epson and PKASO setup commands
9005    PRINT"VisiCalc model: ";a$
9010    PRINT
9020    PRINT"Global options in effect:"
9030    PRINT"     ";b$
9040    PRINT
9041    d$=""
9042    c$="          "
9043    FOR l=1 TO 12
9044      IF((bcol+l)>27) THEN c$="          "
9045      d$=d$+c$+col$(l)
9046      NEXT l
9050    PRINT USING 9060;d$
9060    IMAGE 4x,120R
9070    PRINT
9080    nl=7
9090    RETURN
```

the VisiCalc file and the global parameters at the top of the page along with the column headers for the stripe.

Lines 1800 to 2010 divide the cells into blocks nine elements long and print the blocks. Note the use of the third parameter with MID$. Lines 1980 and 1990 count the lines being printed and cause a skip over the page perforation with a Gosub 9000. Headers are repeated on each page.

The cryptic-looking print statement in line 9000 sends a string of special commands to my Epson MX-80 via a PKASO interface board. Replace these with whatever your printer requires.

Arrival at line 2020 signals the completion of a stripe. Line 2020 increments the marker for the first column in the next stripe. If the start of the next stripe is greater than the number of columns in the VisiCalc model, then line 2024 gets the program out of the loop. Line 2030 tests for the special last stripe on a big model: since VisiCalc's maximum number of columns is 63, the last stripe is only three cells wide.

If another stripe remains to be printed, the program branches to line 114. Here the name of the VisiCalc file and the current values of bcol and ecol are written to disk. I did this to enable the use of Clear in line 122 to set all string storage to null strings and to free up memory in preparation for the next stripe.

Line 145 represents another attempt to keep memory from being cluttered with scraps of string segments: every 100 times through the For . . . Next loop generates a call to the reserved variable FRE, forcing a cleanup of string storage. This is necessitated by the way Apple III Business Basic handles string assignments. If A$ = "DOG" and then is reassigned to "CAT", the string "DOG" remains. Only a call to FRE invokes a cleanup.

Conclusion

Perhaps you perceive an approach to this problem that doesn't involve this many passes through the stored VisiCalc model. If so, then write it up and send it in. But for now, I'm content with this program. Maintaining a notebook with printouts of the models and their formulas saves me time whenever I have a new model to create. I no longer have to swap disks and scan all over the place to see how I did it last time. ■

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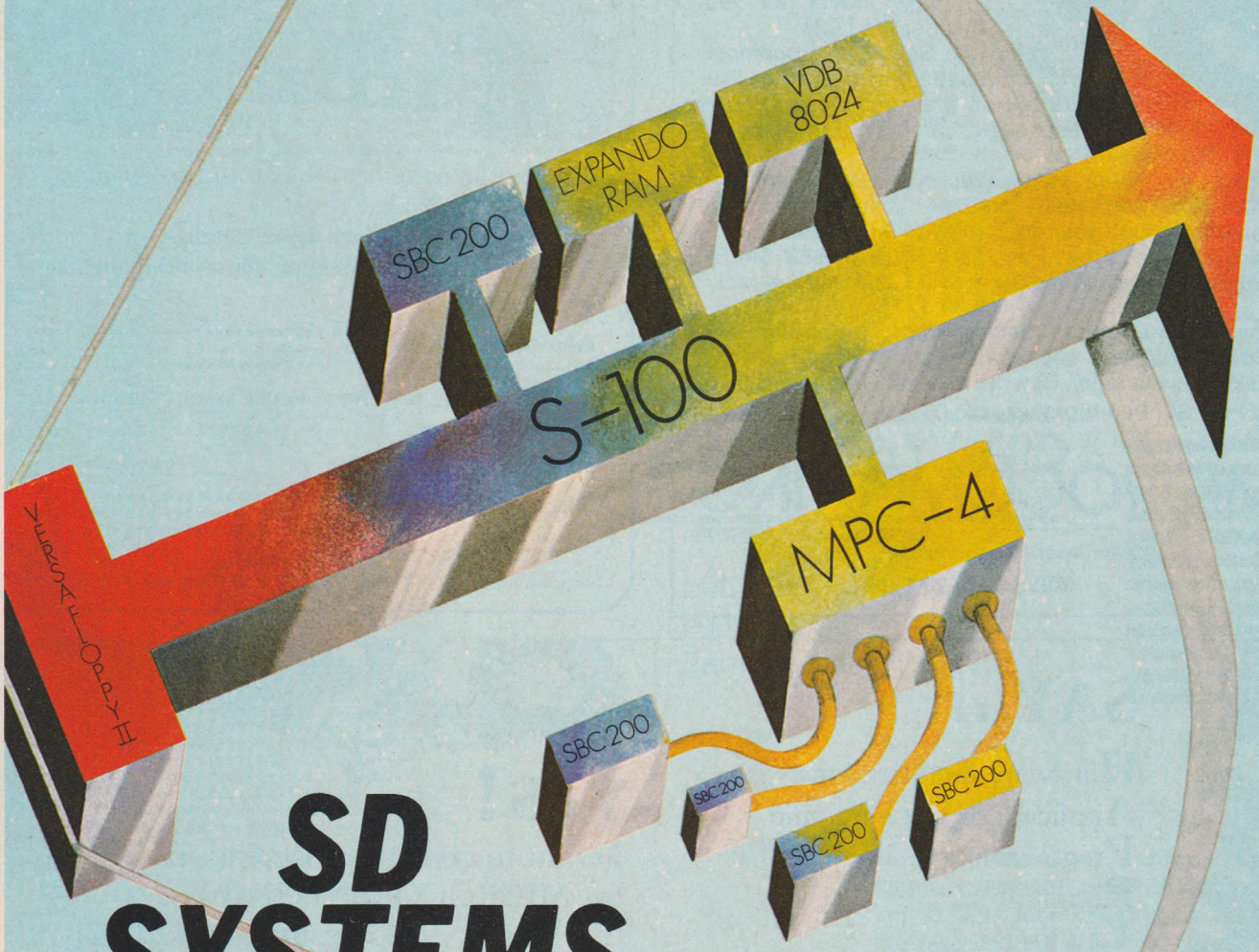

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This Bookshelf Database program for the Apple lets you keep track of the books in your personal library according to author, title, publisher, topic, etc.

By Linda M.B. McKinnon

Bookshelf Database is an Applesoft program for a 48K Apple II Plus. You can add approximately 140 books to the database with the present record structure of accession number, author, title, publisher, ISBN#, catalog number, Library of Congress number and up to three subject headings. The program is completely interactive, with full edit and deletion capability, and lets you manage your library. Once it's set up you can search the database by author, title, publisher or subject. The search queries can also be used in truncated mode.

Applications for the program abound, such as the creation of specialized collections for helping students, professionals or hobbyists organize their information quickly. Bookshelf provides alphabetized listings that are handy to reference when browsing new books at the bookstore. A personalized Bookshelf listing of your textbooks can help prevent duplicate purchases.

The Bookshelf Database Applesoft program (running under DOS 3.3) creates a text file of the books selected for the database. After selecting Input mode from a varied menu, type in the appropriate data for each book to be entered into the database. Accession numbers are automatically assigned so that no duplication occurs. If a book is deleted, its number is not reused.

Be careful not to embed commas in the input data—Applesoft will read them as delimiters and end the input of the record field. If an input error is caught after the program has read the data, you can easily correct it using the Edit option. Duplicate records can be removed with the Delete option.

The entered data is stored on disk alphabetically, by author, in a text file using a binary tree data structure. You can store data at any time—as you progress through the input stage or later on. I've dissected the pro-

Address correspondence to Linda M.B. McKinnon, Courtland Ave., RFD#3, Manchester, NH 03103.

Lines	Function
10-135	Initialization
140-200	Get existing database
400-560	Book input mode
580-880	Search binary tree for alphabetic insert of new record
1000-1200	List book mode using a stack data structure
2000-2380	Delete book mode
3000-3390	Edit book mode
4000-4635	Search book mode
8000-8120	Write text file of records

Table 1. Breakdown of Bookshelf Database program.

```
Bookshelf Database
1—Book Input Mode
2—List All Books
3—Delete a Book
4—Edit a Book
5—Search Database
6—Save Bookshelf & Continue
7—Quit & Update Bookshelf
```

Table 2. Bookshelf Database options menu.

```
Acc #:
Author:
Title:
Publisher:
Year:
ISBN:
Cat. No.:
LC#:
Keyword1:
Keyword2:
Keyword3:
PRESS C TO CONTINUE:
```

Table 3. Book Input Mode example.

```
AC#: 2
AU: Inman D & Inman K
TI: Apple Machine Language
PU: Reston
YR: 1981
IS: 0-8359-0231-5
Cat: QA76.8.A.66156
LI: 80-20083
Key1: Basic operating system
Key2: Machine language
Key3: Mini-assembler
PRESS C TO CONTINUE:
```

Table 4. List All Books Mode example.

```
ACCESSION NO. TO BE DELETED: 2
AUTHOR: INMAN D & INMAN K
AU#: 2
AU: Inman D & Inman K
TI: Apple Machine Language
PU: Reston
YR: 1981
IS: 0-8359-0231-5
Cat: QA76.8.A66156
LC: 80-20083
Key1: Basic operating system
Key2: Machine language
Key3: Mini-assembler
DO YOU WANT TO DELETE THIS ITEM FROM THE DATABASE?
PRESS "Y" FOR YES OR "N" FOR NO!
```

Table 5. Sample of the Delete Mode option.

gram in Table 1. Table 2 shows the program's menu of options.

Book input mode. The Book Input mode prompts you for the author, title, publisher, date of publication, International Standard Book number, Library of Congress number, and up to three key words. To skip fields enter a hyphen for these entries. An example is shown in Table 3.

List all books mode. This option will list the entire database alphabetically by author. You can choose to print on the screen or at the printer. An example appears in Table 4.

Delete a book mode. This mode allows you to search for a book and then delete it. If you discover that you have searched for the incorrect book, it gives you the option of changing your mind and returning to the main menu. You may delete any book except the root node; this node is the root of the tree structure and is the first record or book written in the text file. A sample of the Delete mode option appears in Table 5.

Edit mode. This mode lets you change any data in a record with the exception of the accession number. It presents you with the actual record as it appears in the database. You can edit the record field by field. If there are no changes, then you would press return; otherwise, you would type in the correction data.

Search mode. The Search mode allows you to search by author, title, publisher or subject. You can truncate information if you are unsure of a particular entry. To truncate you simply substitute a question mark in place of the remainder of the word, and the program will select all data that starts with the characters preceding the question mark. While in Search mode, all records containing search data are presented on the screen, one at a time, until all items have been found.

The program lets you save the database as a textfile (Bookshelf) while you are using the database or after you have completed your session at the computer.■

Listing 1. Applesoft Bookshelf Database program.

```
]LIST

10  REM  BOOK DATA BASE FILED BY
     AUTHOR
12  REM  BY LINDA M. MCKINNON
13  REM  COURTLAND AVE RFD#3
14  REM  MANCHESTER,NH 03103
15  DIM N(300): REM  ACCESSION NO

20  DIM AU$(300): REM  AUTHOR ARR
     AY
30  DIM TI$(300): REM  TITLE ARRA
     Y
40  DIM PU$(300): REM  PUBLISHER
      ARRAY
50  DIM YR$(300): REM  YEAR OF PU
     BLICATION ARRAY
60  DIM IS$(300): REM  ISBN NUMBE
     R
62  DIM CA$(300): REM  LIBRARY CO
     NGRESS NUMBER
70  DIM K1$(300): REM  KEY WORD#1

80  DIM K2$(300): REM  KEY WORD#2

90  DIM K3$(300): REM  KEY WORD#3

100  DIM L%(300): REM  LEFT NODE
     ARRAY OF TREE
110  DIM R%(300): REM  RIGHT NODE
      ARRAY OF TREE
120  DIM S%(300): REM  STACK ARRA
     Y
130  DIM R(100): REM  NUMBER RECO
     RDS IN DATA BASE
135 D$ =  CHR$ (4)
140  PRINT D$;"OPEN BOOKSHELF"
150  CALL  - 936: INPUT "ARE YOU
     CREATING A NEW BOOKSHELF? (Y
     /N) ";Q$: IF Q$ = "Y" THEN 2
     12
160  PRINT D$;"READ BOOKSHELF"
170  INPUT R: INPUT J: REM  NO OF
      RECORDS & LAST ACC NO.
180  FOR I = 1 TO R
185  INPUT N(I): INPUT AU$(I): INPUT
     TI$(I): INPUT PU$(I)
190  INPUT YR$(I): INPUT IS$(I): INPUT
     CA$(I): INPUT LC$(I)
192  INPUT K1$(I): INPUT K2$(I): INPUT
     K3$(I)
194  INPUT L%(I): INPUT R%(I)
200  NEXT I
210  PRINT D$
212  CALL  - 936
215 X$ = "BOOKSHELF DATA BASE": VTAB
     3
217  PRINT  TAB( 20 - ( LEN (X$))
      / 2);X$: PRINT : PRINT : PRINT

220  PRINT  TAB( 10);"1-BOOK INPU
     T MODE"
230  PRINT  TAB( 10);"2-LIST ALL
     BOOKS"
240  PRINT  TAB( 10);"3-DELETE A
     BOOK"
245  PRINT  TAB( 10);"4-EDIT A CI
     TATION"
250  PRINT  TAB( 10);"5-SEARCH DA
     TA BASE"
260  PRINT  TAB( 10);"6-SAVE BOOK
     SHELF & CONTINUE"
262  PRINT  TAB( 10);"7-QUIT & UP
     DATE BOOKSHELF"
270  PRINT : PRINT : PRINT
275  INPUT "ENTER OPTION: ";QQ
280  IF QQ < 1 OR QQ > 7 THEN 275

290  ON QQ GOSUB 400,1000,2000,30
     00,4000,8000,8000
300  IF QQ <  > 7 THEN 212
310  END
320 :
390 :
400  REM  BOOK INPUT MODE SUBROUT
     INE
405 X$ = "BOOK INPUT MODE"
410  CALL  - 936: PRINT  TAB( 20 -
     ( LEN (X$)) / 2);X$: PRINT :
      PRINT
420 R = R + 1:J = J + 1
430 I = 1: REM  SEARCH AT ROOT NO
     DE
435  PRINT "ACC #: ";J
440  INPUT "AUTHOR:  ";A1$: IF  LEN
     (A1$) < 1 THEN 440
450  INPUT "TITLE:   ";T1$: IF  LEN
     (T1$) < 1 THEN 450
460  INPUT "PUBLISH: ";P1$: IF  LEN
     (P1$) < 1 THEN 460
470  INPUT "YEAR:    ";Y1$: IF  LEN
     (Y1$) < 1 THEN 470
480  INPUT "ISBN:    ";I1$: IF  LEN
     (I1$) < 1 THEN 480
482  INPUT "CAT NO:  ";C1$: IF  LEN
     (C1$) < 1 THEN 482
484  INPUT "LC #     ";L1$: IF  LEN
     (L1$) < 1 THEN 484
490  INPUT "KEYWORD1:";KA$: IF  LEN
     (KA$) < 1 THEN 490
500  INPUT "KEYWORD2:";KB$: IF  LEN
     (KB$) < 1 THEN 500
510  INPUT "KEYWORD3:";KC$: IF  LEN
     (KC$) < 1 THEN 510
520  IF A1$ >  = AU$(I) THEN 730:
      REM  SEARCH RT BRANCH
530  GOTO 580: REM  ELSE SEARCH L
     EFT BRANCH
540  PRINT "PRESS RETURN TO CONTI
     NUE!"
550  GET Q$: IF Q$ <  > CHR$ (13
     ) THEN 550
560  RETURN
570 :
580  REM  SEARCH LEFT BRANCH SUBR
     OUTING(IF IT ISN'T FULL)
590  IF L%(I) <  > 0 THEN I = L%(
     I): GOTO 520
600  REM  ADD NEW LEFT LINK
610 L%(I) = J
612 N(R) = J
620 AU$(J) = A1$: REM  ADD NEW R
     ECORD
630 TI$(J) = T1$
640 PU$(J) = P1$
650 YR$(J) = Y1$
652 IS$(J) = I1$
654 CA$(J) = C1$
656 LC$(J) = L1$
660 K1$(J) = KA$
680 K2$(J) = KB$
```

More

Listing continued.

```
690 K3$(J) = KC$
700 L%(J) = 0
710 R%(J) = 0
720  RETURN
725 :
730  REM  SEARCH RT BRANCH IF NOT
     FULL
740  IF R%(I) < > 0 THEN I = R%(
     I): GOTO 520
760  REM  ADD RIGHT NODE
770 R%(I) = J
772 N(J) = J
780 AU$(J) = A1$
790 TI$(J) = T1$
800 PU$(J) = P1$
810 YR$(J) = Y1$
820 IS$(J) = I1$
824 CA$(J) = C1$
826 LC$(J) = L1$
830 K1$(J) = KA$
840 K2$(J) = KB$
850 K3$(J) = KC$
860 R%(J) = 0
870 L%(J) = 0
880  RETURN
890 :
1000  REM  LIST ALL BOOKS SUBROUT
     INE
1010 P = 1:T = 0: CALL  - 936: REM
      INITIALIZE VARIABLES
1020  PRINT "TYPE '1' IF YOU WANT
      A HARD COPY VERSION, OTHERW
     ISE, ENTER '0': ": INPUT QQ:
      IF QQ = 1 THEN  PR# 1
1030  CALL  - 936
1040 T = T + 1
1050 S%(T) = P: REM  PUSH ON STAC
     K
1060  IF P < > 0 THEN P = L%(P):
      GOTO 1040
1070 T = T - 1
1080  IF T < = 0 THEN QQ = 0: PR#
     0: PRINT "ALL BOOKS LISTED!"
     : PRINT : PRINT : PRINT "PRE
     SS 'C' TO CONTINUE": INPUT A
     $: IF A$ = "C" THEN  RETURN

1090 P = S%(T): REM  POP THE STAC
     K
1100 X$ = "LIST ALL BOOKS MODE"
1103  IF N(P) = 0 THEN 1170
1105  IF QQ = 0 THEN  PRINT  TAB(
     20 - ( LEN (X$)) / 2);X$
1110  PRINT : PRINT : PRINT
1112  PRINT "AC #: ";N(P)
1115  PRINT "AU:  ";AU$(P): REM
     PRINT AUTHOR
1118  PRINT "TI:  ";TI$(P): PRINT
     "PU:  ";PU$(P)
1120  PRINT "YR:  ";YR$(P): PRINT
     "IS:  ";IS$(P)
1122  PRINT "CAT: ";CA$(P): PRINT
     "LI:  ";LC$(P)
1125  PRINT "KEY: ";K1$(P): PRINT
     "KEY: ";K2$(P)
1130  PRINT "KEY: ";K3$(P)
1140  PRINT : PRINT : PRINT
1150  IF QQ = 0 THEN  PRINT "PRES
     S 'C' TO SEE THE NEXT CITATI
     ON ": INPUT A$: IF A$ < > "
     C" THEN 1150
1160  CALL  - 936
1170 T = T - 1
1180 P = R%(P): REM  CHECK RIGHT
     BRANCH
1190  GOTO 1040
1200 :
2000  REM  DELETE A BOOK SUBROUTI
     NE
2004  REM  RTEMP & LTEMP ARE POIN
     TERS TO RECORD WE WANT TO DE
     LETE
2005 RTEMP = 0:LTEMP = 0
2010  CALL  - 936
2020 X$ = "DELETE A BOOK MODE"
2030  PRINT  TAB( 20 - ( LEN (X$)
     ) / 2);X$: PRINT : PRINT
2040  INPUT "ACCESSION NO. TO BE
     DELETED: ";N(DLTE)
2042  IF N(DLTE) = 1 THEN  PRINT
     "THIS IS THE TREE ROOT NODE"
     : PRINT "YOU CAN NOT DELETE
     IT": PRINT "YOU MAY EDIT IT
     WITH ALL NEW ": PRINT "INFOR
     MATION!": GOTO 2310
2050  IF (N(DLTE) < 1) OR (N(DLTE
     ) > J) THEN  PRINT "ACCESSIO
     N NUMBER NOT IN DATA BASE!":
      PRINT "TRY AGAIN!": GOTO 20
     40
2060  INPUT "AUTHOR:";AU$(N(DLTE)
     )
2080  PRINT :I = 1: REM  START AT
      BEG OF TREE
2085  PRINT "**********************
     **********"
2090  IF AU$(N(DLTE)) > AU$(I) THEN
     2360
2095  IF AU$(N(DLTE)) < AU$(I) THEN
     2340
2096  IF N(DLTE) < > N(I) THEN 2
     360
2097  REM  RECORD FOUND
2098  PRINT "AC#: ";N(I)
2100  PRINT "AU:  ";AU$(I)
2110  PRINT "TI:  ";TI$(I)
2120  PRINT "PU:  ";PU$(I)
2130  PRINT "YR:  ";YR$(I)
2140  PRINT "IS:  ";IS$(I)
2150  PRINT "CAT: ";CA$(I)
2160  PRINT "LC:  ";LC$(I)
2170  PRINT "KEY1:";K1$(I)
2180  PRINT "KEY2:";K2$(I)
2190  PRINT "KEY3:";K3$(I)
2194  PRINT
2195  PRINT "**********************
     **********"
2200  PRINT : PRINT "DO YOU WANT
     TO DELETE THIS ITEM FROM THE
      DATA BASE?": PRINT "PRESS '
     Y' FOR YES OR 'N' FOR NO!": INPUT
     A$: IF A$ = "N" THEN 2330
2205  IF A$ < > "Y" THEN 2200
2206 :
2208 :
2210  REM  HOOK UP NODE PTRS-LTEM
     P OR RTEMP ARE PTRS TO N(DLT
     E)
2220  IF RTEMP < > 0 THEN R%(RTE
     MP) = R%(N(DLTE)): GOTO 2230

2222  REM  IF RTEMP=0 THEN LTEMP
     PTS TO N(DLTE)
2224  IF LTEMP < > 0 THEN L%(LTE
     MPP) = L%(N(DLTE)): GOTO 227
     0
2226 :
2230 I = 1: REM  RECORD GETS ENTE
     RED AGAIN (L%(N(DLTE)))
2232  IF AU$(L%(N(DLTE))) > = AU
     $(L%(I)) THEN 2242
2234  REM  SEARCH LEFT BRANCH
2236  IF L%(I) < > 0 THEN I = L%
     (I): GOTO 2232
2238  REM  ADD NEW LINK
2240 L%(I) = L%(N(DLTE)): GOTO 23
     00
2242  REM  SEARCH RIGHT BRANCH
2244  IF R%(I) < > 0 THEN I = R%
     (I): GOTO 2232
2246  REM  ADD NEW LINK
2248 R%(I) = L%(N(DLTE)): GOTO 23
     00
2250 :
2252 :
2270 I = 1: REM  RECORD GETS REEN
     TERED (R%(N(DLTE)))
2272  IF AU$(R%(N(DLTE))) > = AU
     $(I) THEN 2282
2274  REM  SEARCH LEFT BRANCH
2276  IF L%(I) < > 0 THEN I = L$
     (I): GOTO 2272
2278  REM  ADD NEW LINK
2280 L%(I) = R%(N(DLTE)): GOTO 23
     00
2282  REM  SEARCH RIGHT BRANCH
2284  IF R%(I) < > 0 THEN I = R%
     (I): GOTO 2272
2286  REM  ADD NEW LINK
2290 R%(I) = R%(N(DLTE)): GOTO 23
     00
2292 :
2294 :
2300  PRINT : PRINT : PRINT "ACCE
     SSION  ";N(DLTE);" HAS BEEN
     DELETED!"
2305 R = R - 1
2310  PRINT "PRESS 'C' TO CONTINU
     E!": INPUT A$: IF A$ = "C" THEN
     212
2330  RETURN
2332 :
2334 :
2340  REM  SEARCH LEFT SIDE OF TR
     EE FOR RECORD AND PTR TO REC
     ORD
2350  IF L%(I) < > 0 THEN  IF L%
     (I) < > N(DLTE) THEN I = L%
     (I): GOTO 2090
2351  IF L%(I) = N(DLTE) THEN LTE
     MP = I:I = L%(I): GOTO 2090
2352  IF L%(I) = 0 THEN  PRINT "B
     OOK NOT IN DATA BASE"
2353 :
2354 :
2355  PRINT "PRESS 'C' TO CONTINU
     E!": INPUT A$: IF A$ = "C" THEN
     212
2356 :
2357 :
2360  REM  SEARCH RT SIDE OF TREE
      FOR PTR TO RECORD AND FOR R
     ECORD
2370  IF R%(I) < > 0 THEN  IF R%
     (I) < > N(DLTE) THEN I = R%
     (I): GOTO 2090
2372  IF R%(I) = N(DLTE) THEN RTE
     MP = I:I = R%(I): GOTO 2090
2380  IF R%(I) = 0 THEN  GOTO 235
     2
3000  REM  EDIT A BOOK SUBROUTINE

3003  REM  RTEMP & LTEMP ARE POIN
     TERS TO RECORD WE WANT TO ED
     IT
3006 RTEMP = 0:LTEMP = 0
3010  CALL  936
3020 X$ = "EDIT A BOOK MODE"
3030  PRINT  TAB( 20 - ( LEN (X$)
     ) / 2);X$: PRINT : PRINT
3040  INPUT "ACCESSION NO. TO EDI
     T:";N(EDIT)
3050  IF (N(EDIT) < 1) OR (N(EDIT
     ) > J) THEN  PRINT "ACCESSIO
     N NUMBER NOT IN DATA BASE!":
      PRINT "TRY AGAIN": GOTO 304
     0
3060  INPUT "AUTHOR:";AU$(N(EDIT)
     )
3080  PRINT :I = 1: REM  SEARCH A
     T BEG OF TREE
3090  IF AU$(N(EDIT)) > AU$(I) THEN
     3360
3100  IF AU$(N(EDIT)) < AU$(I) THEN
     3340
3103  IF N(EDIT) < > N(I) THEN 3
     340
3105  REM  RECORD FOUND
3110  PRINT "IF 'NEW' = 'OLD' THE
     N PRESS 'RETURN' !"
3115  PRINT  TAB( 15);"**********
     "
3120  PRINT "ACC #:";N(I)
3130  PRINT "OLD AUTHOR:";AU$(I)
3140  INPUT "NEW AUTHOR:";Q1$: IF
      Q1$ < > "" THEN AU$(1) = Q1
     $
3150  PRINT "OLD TITLE:";TI$(I)
3160  INPUT "NEW TITLE: ";Q1$: IF
      Q1$ < > "" THEN T1$(I) = Q1
     $
3170  PRINT "OLD PUBLISHER:";PU$(
     I)
3180  INPUT "NEW PUBLISHER:";Q1$:
      IF Q1$ < > "" THEN PU$(I) =
      Q1$
3190  PRINT "OLD YEAR:";YR$(I)
3200  INPUT "NEW YEAR:";Q1$: IF Q
     1$ < > "" THEN YR$(I) = Q1$

3210  PRINT "OLD ISBN #:";IS$(I)
3220  INPUT "NEW ISBN #:";Q1$: IF
      Q1$ < > "" THEN IS$(I) = Q1
     $
3230  PRINT "OLD CATALOG #:";CA$(
     I)
3240  INPUT "NEW CATALOG #:";Q1$:
      IF Q1$ < > "" THEN CA$(I) =
      Q1$
3250  PRINT "OLD LIBRARY CONG#:";
     LC$(I)
3260  INPUT "NEW LIBRARY CONG#:";
     Q1$: IF Q1$ < > "" THEN LC$
     (I) = Q1$
3270  PRINT "OLD KEY1:"K1$(I)
```

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Listing continued.

```
3280  INPUT "NEW KEY1:";Q1$: IF Q
      1$ <  > "" THEN K1$(I) = Q1$
3290  PRINT "OLD KEY2:";K2$(I)
3300  INPUT "NEW KEY2:";Q1$: IF Q
      1$ <  > "" THEN K2$(I) = Q1$

3310  PRINT "OLD KEY3:";K3$(I)
3320  INPUT "NEW KEY3:";Q1$: IF Q
      1$ <  > "" THEN K3$(I) = Q1$

3330  RETURN
3340  REM  SEARCH THE LEFT SIDE O
      F TREE
3350  IF L%(I) <  > 0 THEN I = L%
      (I): GOTO 3090
3360  REM  SEARCH RIGHT SIDE OF T
      REE
3370  IF R%(I) <  > 0 THEN I = R%
      (I): GOTO 3090
3380  PRINT "ITEM NOT IN DATA BAS
      E!": INPUT "PRESS 'C' TO CON
      TINUE!";C$: IF C$ = "C" THEN
      3330
3390 :
4000  REM  SEARCH DATA BASE MODE
      SUBROUTINE
4005 QQ = 0
4010  CALL  - 936
4020 X$ = "SEARCH DATA BASE MODE"

4030  PRINT  TAB( 20 - ( LEN (X$)
      ) / 2);X$: PRINT : PRINT
4040  PRINT  TAB( 10);"SEARCH SEL
      ECTION:": PRINT
4050  PRINT  TAB( 12);"1..AUTHOR"

4060  PRINT  TAB( 12);"2..TITLE"
4070  PRINT  TAB( 12);"3..PUBLISH
      ER"
4075  PRINT  TAB( 12);"4..SUBJECT
      "
4080  PRINT  TAB( 12);"5..EXIT SE
      ARCH MODE"
4085  PRINT : PRINT : PRINT
4087 P = 1:T = 0: REM  INITIALIZE
      VARIABLES
4090  INPUT "SELECTION:";Q: IF (Q
      < 1) OR (Q > 5) THEN 4090
4200  IF Q = 5 THEN  RETURN
4220  INPUT "SEARCH QUERRY:";Q1$
4300  IF QQ = 0 THEN  CALL  - 936

4310  PRINT "TYPE '1' IF YOU WANT
      A HARD COPY VERSION, OTHERW
      ISE, ENTER '0'": INPUT QQ: IF
      QQ = 1 THEN  PR# 1
4320  IF QQ = 0 THEN  CALL  - 936

4330 T = T + 1
4340 S%(T) = P: REM  PUSH ON STAC
      K
4350  IF P <  > 0 THEN P = L%(P):
      GOTO 4330
4360 T = T - 1
4370  IF T <  = 0 THEN  CALL  - 9
      36: PR# 0: PRINT "SEARCH COM
      PLETED!- ALL ITEMS SEARCH!":
       PRINT : INPUT "PRESS 'C' TO
       CONTINUE";A$: IF A$ = "C" THEN
      4010
4380 P = S%(T): REM  POP STACK
4385  ON Q GOTO 4600,4610,4620,46
      30
4410  IF QQ = 0 THEN  PRINT  TAB(
      20 - ( LEN (X$)) / 2);X$
4420  PRINT : PRINT : PRINT
4430  PRINT "AC #:";N(P)
4440  PRINT "AU:  ";AU$(P)
4445  PRINT "TI:  ";TI$(P)
4450  PRINT "PU:  ";PU$(P)
4460  PRINT "YR:  ";YR$(P)
4470  PRINT "IS:  ";IS$(P)
4480  PRINT "CAT: ";CA$(P)
4490  PRINT "LC:  ";LC$(P)
4500  PRINT "KEY: ";K1$(P): PRINT
      "KEY: ";K2$(P)
4510  PRINT "KEY: ";K3$(P)
4520  PRINT : PRINT : PRINT
4530  IF QQ = 0 THEN  PRINT "PRES
      S 'C' TO SEE NEXT ITEM!": INPUT
      A$: CALL  - 936: IF A$ <  >
      "C" THEN 4530
4550 T = T - 1
4560 P = R%(P): REM  CHECK RIGHT
      BRANCH
4570  GOTO 4330
4600  IF  RIGHT$ (Q1$,1) = "?" THEN
       IF  LEFT$ (Q1$,( LEN (Q1$) -
      1)) =  LEFT$ (AU$(P),( LEN (
      Q1$) - 1)) THEN 4410
4602  IF (Q1$ <  > AU$(P)) THEN 4
      550
4605  GOTO 4410
4610  IF  RIGHT$ (Q1$,1) = "?" THEN
       IF  LEFT$ (Q1$,( LEN (Q1$) -
      1)) =  LEFT$ (TI$(P),( LEN (
      Q1$) - 1)) THEN 4410
4612  IF (Q1$ <  > TI$(P)) THEN 4
      550
4615  GOTO 4410
4620  IF  RIGHT$ (Q1$,1) = "?" THEN
       IF  LEFT$ (Q1$,( LEN (Q1$) -
      1)) =  LEFT$ (PU$(P),( LEN (
      Q1$) - 1)) THEN 4410
4621  IF (Q1$ <  > PU$(P)) THEN 4
      550
4622  GOTO 4410
4630 ZK$ =  LEFT$ (Q1$,( LEN (Q1$
      ) - 1)):ZX$ =  LEFT$ (K1$(P)
      , LEN (Q1$) - 1)
4631 ZY$ =  LEFT$ (K2$(P), LEN (Q
      1$) - 1):ZZ$ =  LEFT$ (K3$(P
      ), LEN (Q1$) - 1)
4632  IF  RIGHT$ (Q1$,1) = "?" THEN
       IF (ZK$ = ZX$) OR (ZK$ = ZY
      $) OR (ZK$ = ZZ$) THEN 4410
4634  IF (Q1$ <  > K1$(P)) AND (Q
      1$ <  > K2$(P)) AND (Q1$ <  >
      K3$(P)) THEN 4550
4635  GOTO 4410
8000  REM  WRITE NEW RECORDS SUBR
      OUTINE
8010  PRINT D$;"DELETE BOOKSHELF"

8020  PRINT D$;"OPEN BOOKSHELF"
8030  PRINT D$;"WRITE BOOKSHELF"
8040  PRINT R: PRINT J
8050  FOR I = 1 TO R
8055  PRINT N(I)
8060  PRINT AU$(I): PRINT TI$(I):
      PRINT PU$(I):
8070  PRINT YR$(I): PRINT IS$(I):
      PRINT CA$(I)
8075  PRINT LC$(I): PRINT K1$(I)
8080  PRINT K2$(I): PRINT K3$(I):
      PRINT LX(I): PRINT RX(I)
8090  NEXT I
8100  PRINT D$;"CLOSE"
8110  RETURN
8120 :
21120  PRINT "JN:  ";JN$(I)
```

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Putting the Sharp PC Through Its Paces

Out on the track, the Sharp Pocket Computer performs like a real champion: It can do all those tasks of a regulation-size home computer but with the price and portability of a pocket computer.

By Tim Daniel

Writing an ad for Sharp Electronics Corporation's PC-1500 pocket computer would be easy. Just tell everyone how small this computer is. Speak of its powerful Basic and boast about the accessory CE-150, an ingenious four-color printer and cassette interface. Wouldn't it be nice if after all the hype was forgotten the PC-1500 was still around to prove your ad right? I cautiously propose that this computer will not only live up to your expectations but exceed them.

A Quick Look

The PC-1500, measuring 7¾ × 3¼ × 1 inch and weighing about as much as a pound of hamburger, is larger than Sharp's firstborn, the PC-1211. I hesitate to call it a "pocket computer," preferring the phrase "corner of the briefcase computer," though that doesn't make for good ad copy.

Nor will an ad be likely to extoll the PC-1500's eight-bit CMOS microprocessor—old stuff in this age of 16-bit monsters. But what may be time proven need not be mundane. Sharp proves this by combining the microprocessor with 16K ROM, 3.5K of RAM, a 65-key keyboard and a 156 × 7 liquid crystal display.

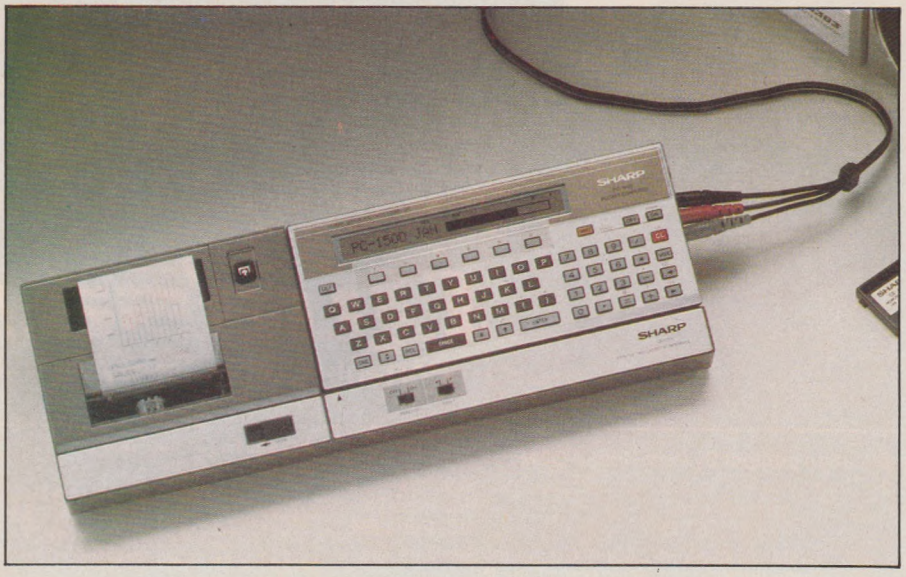
The $300 list price of a PC-1500 pays for some pretty sophisticated electronics. Mindful of its battery lifeline, the PC-1500 shuts itself down if you don't give it something to do. Shutdown need not be a cause for worry though. The program and variables in memory stay there thanks to the computer's Memory Safe Guard. Another feature that Sharp doesn't tell you about allows the computer's four AA batteries to be removed for short periods of time without losing your program.

If computational power rather than battery power is your interest, then consider that the PC-1500 is a calculator as well as a computer. It offers the typical four-banger functions plus square roots and pi via single-key entry. Natural and common logs, exponential, trig and inverse trig, plus angular conversions are available as multikey commands. A conventional algebraic hierarchy is employed (sorry, RPN fans) and calculations are carried out to ten places. If the decimal system bores you, then try using hexademical values. The PC-1500 can handle those too.

There is a time and a place for ordinary calculators; many pocket computer owners prove this by using their expensive machines to solve problems that a cheaper programmable calculator could handle. But as much as I like my trusty TI "scientific" for quick number crunching, it looks like a moron when compared to the Basic-speaking PC-1500. One caveat though—if you're not prepared to jump in and do your own programming, think twice about buying a PC-1500. Or at least wait until a variety of commercial software is available. At this writing not much can be had other than what you copy out of Sharp's application manual or write yourself (see sidebar).

Word Processing?

I'll spoil the fun early by saying that I did not write this article using the PC-1500 as my word processor. Its QWERTY keyboard and upper/lowercase capability notwithstand-



The PC-1500's 7 × 156 dot liquid crystal screen can display up to 26 characters or be programmed with special graphics commands. The top of the display has several special status indicators.

Address correspondence to Tim Daniel, 7 Peabody Drive, Oxford, OH 45056.

ing, a 26-digit display is just not meant for serious text handling. Besides, who would even consider writing the next great American novel on a computer that has no apostrophe?

If you are willing to accept the limit of 26 digits, then you probably won't balk at the fact that the energy-saving liquid crystal display is next to useless in bright or subdued light. As long as I'm criticizing, it should be noted that the shift key is too small. The shift gets a heavy workout since it provides for commas, quotation marks and other basic tools. Luckily you can survive the ill sized shift key, thanks to the PC-1500's method of correcting for the fumbling finger phenomenon.

The PC-1500's editing features are a snap to learn. There are keys to move the cursor to the left or to the right. You can insert or delete one character at a time; when editing a program you can scroll up or down, from one line to the next. The one-line display doesn't seem as restrictive when you consider that the 80-character input buffer allows for some pretty long lines. I'm prone to use multistatement lines, so the left arrow key became a good friend as I attempted to find out what lurked just out of sight.

I grew to like the single-line display, finding it easy to concentrate on the pertinent code when I was debugging. Of course if your programs jump around then be prepared to go crazy if a printout isn't available.

Memory Enough

Before launching into a review of "extended" pocket Basic let's take another look at the PC-1500 innards, in particular its memory. If you own a disk drive you probably thought I forgot a zero when I said that the PC-1500 has 3.5K of RAM. On the other hand, if you have an unexpanded Sinclair ZX-80 you are probably rabidly envious of the Sharp's abundance of memory. In reality, you the user only get to handle 2.6K—900 bytes of RAM are claimed by the system. Just as the omniscient system claims a healthy chunk of RAM, it also dictates how you can use the rest.

Variables A–Z and A$–Z$ claim 624 bytes. If you use other variable names like AZ or Q7$, they are stored at one end of the 1850-byte program memory. Your program starts at the other end and can expand until it meets up with the variables or the 1850-byte limit. Another 188 bytes is listed as reserve area; perhaps it works only one Saturday a month. All this totals up to 2662 bytes—don't ask me where the extra 62 bytes came from. All I know is what I read.

If your thirst for memory exceeds the PC-1500's internal offerings, consider adding on. A port on the computer's backside can accommodate up to 16K of RAM, ROM or a RAM/ROM combination. So far all you have to choose from is the CE-151 4K RAM module (list price $75) or, for you 10-megabyte Winchester fans, the CE-155, 8K of RAM (list price, $150). Mass storage, via the optional CE-150 cassette interface, is also available. More on this later.

Pocket Basic

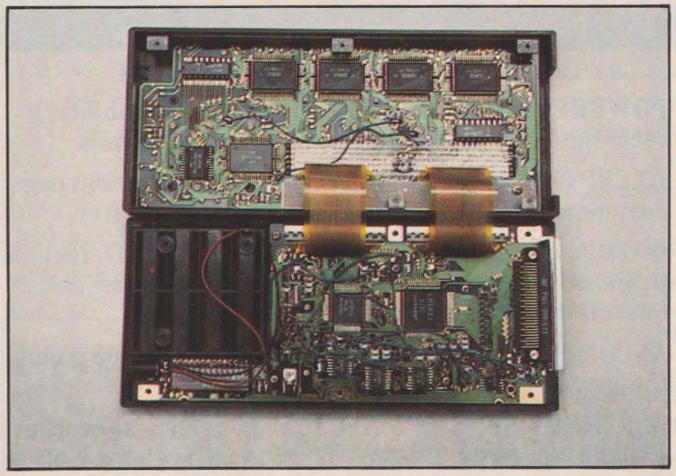
Most of the PC-1500's Basic functions and statements will be familiar to users of Applesoft or Radio Shack Level II Basic. Table 1 lists the common features. Table 2 is a menu of functions, statements and commands that are likely to be indigenous to the Sharp.

Owners of the trailblazing PC-1211 pocket computer will note the PC-1500's improved string capability, which includes functions like LEFT$ and CHR$. Memory allocations for strings have a default length of 16 characters but they can be dimensioned to 80 characters. Or if you need to save memory the length can be set to something less than 16.

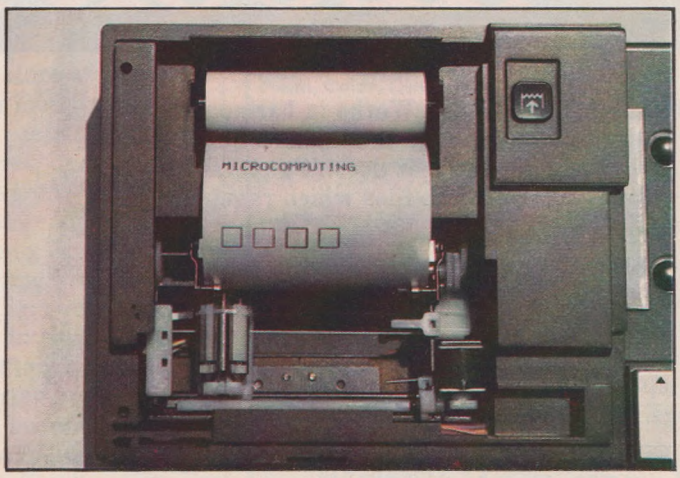
Along with its sophisticated string handling, the latest Sharp provides for two-dimensional arrays, up to 255 ×255. Still not impressed? Consider that extended pocket Basic offers both natural *and* common logs, inverse sine and cosine, and angular conversions. You won't find this combination of problem solvers built into Applesoft or Level II Basic.

Another singular PC-1500 function is Time; this allows easy access to the continuous real-time clock, giving you everything from the month to the second. Beep is a Sharp feature that will warm the heart of anyone who has resorted to machine-language code to get noise from his computer. All that Beep requires is three delimiters that govern the number of beeps (1 to 65535 repetitions), the frequency (230 Hz to 7.8 kHz in 256 steps) and the tone duration (zero to approximately two minutes). Unfortunately the Beep tones are as hard to hear as they are easy to program.

If Beep and Time seem like appetizers rather than the main course, con-



The guts of a PC-1500 consist of two double-sided circuit boards that hold a handful of proprietary flat-pack integrated circuits. The battery compartment, lower left, holds four AA cells. A 60-pin connector, top center, brings out data and address lines plus control and timing signals.



The CE-150 printer uses four tiny ball-point pens and a unique mechanical drive to make a versatile unit for plotting lines or printing text. The vertical movement is actually accomplished by moving the paper up and down. It's as simple as it sounds.

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sider how the PC-1500 garnishes its rather ordinary print statements with Using, Wait and Pause. Using controls the number of digits, location of decimal point, etc., something like the Fortran Format statement. Pause instructs the print statement to display its contents for almost a second and requires no Enter command to keep the program rolling. Wait does the same thing as Pause except that you set the length of time the display is held, anything from 0 to about 17 minutes. Careful use of Wait results in a handy way to generate time constants without using a program loop.

No program is perfect the first time it runs, and the PC-1500 reminds you of that with 46 error messages. There are 32 errors associated with the computer itself, five assigned to the cassette interface and nine for the printer. Complementing the error messages is the PC-1500's TRON debugging feature. This lets you trace your program, one line at a time, stopping after each line is executed. TRON can be used as a command or embedded in a program as a Basic statement. Error trapping can be built into your program by using the On Error Goto statement.

Once your program is perfected you can protect it from harm by locking the computer in the run mode. Or, if you wish, lock it in one of its other two modes, program or reserve. Unlock restores normal functioning.

Running pocket computer programs is made speedier by using the Reserve feature. Here is where those 188 bytes of reserve memory enter the picture, along with the six keys located directly below the display. Preceded by a shift key they give the usual ! or "; otherwise these six buttons act as programmable keys. There are three levels of reserve, so you can execute up to 18 different reserve functions, ranging from commands like Run or CLoad to Basic statements like Print and Goto.

Another method for starting program execution is provided by the DEF key. You can store as many as 18 labeled programs in memory, running your choice by pressing DEF followed by the corresponding label key. DEF also allows you to retrieve any of the ten preassigned key words like Input and Goto, saving time when you type in programs. A third application of DEF lets you assign a value to a variable in the PC-1500's immediate mode, then retrieve the defined variable during program execution of an ARead statement.

There is one more method of starting a program. If the first line in your program has an ARun statement, the program starts up the moment the PC-1500 is turned on. If all of this talk about DEF, Reserve, ARead and

ABS	MID$
AND	NOT
ASC	OR
ATN	RIGHT$
CHR$	RND
COS	SGN
EXP	SIN
INKEY$	SQR
INT	STR$
LEFT$	TAN
LEN	VAL
MEM	

Table 1a. Functions common to "standard" Basic and PC-1500 Basic.

CLEAR
CLS
DATA
DIM
END
FOR, TO, STEP
GOSUB
GOTO
IF
LET
NEXT
ON ERROR GOTO
ON, GOSUB
ON, GOTO
PRINT
READ
REM
RESTORE
RETURN
STOP
THEN
TRON
TROFF
USING

Table 1b. Statements common to "standard" Basic and PC-1500 Basic.

CONT
LIST
NEW
RUN
CLOAD
CSAVE

Table 1c. Commands common to the "standard" microcomputer and the PC-1500.

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ARun seems confusing, take heart—you can always type Run and be done with it.

Utilitarian Display?

Sharp hands you a graphics display area that is 156 dots long by 7 dots wide. I cannot, in all honesty, figure out what you're supposed to do with this gift. Individuals more creative than I will find four statements and one function to control the display. CLS clears the screen; that I can handle. The Cursor statement is not very threatening either. All it does is position the cursor at the start of one of the 26-character positions on the display. Very handy if you are printing more than one variable at a time; sort of like a tab key on a typewriter.

It's the next three, GCursor, GPrint and Point, that I have trou-

ACS	$\cos^{-1}$
ASN	$\sin^{-1}$
DEG	Converts decimal degrees to degrees, minutes, seconds
DMS	Converts degrees, minutes, seconds to decimal degrees
LOG	$\log_{10}x$
LN	$\log_{e}x$
PI	3.141592654
POINT	Returns a number describing a dot column in the display
STATUS	Number of program steps already used
TIME	month, day, hour, minute, second

Table 2a. Unique functions of the PC-1500.

AREAD	Display contents becomes specified variable
ARUN	Program executes automatically after power is turned on
BEEP	Sound command, number, length and frequency of tone can be specified
CURSOR	Specifies starting position of display
DEGREE	Specifies angular mode
GCURSOR	Specifies display position by dot units
GPRINT	Controls one column of dots on display
GRAD	Angular mode designation
LOCK	Locks computer's mode
PAUSE	"Semiautomatic" form of Print
RADIAN	Angular mode designation
USING	Controls format of printed variable
WAIT	Specifies duration of display for Print statement

Table 2b. Unique statements of the PC-1500.

CHAIN	When used in an existing program another cassette program is loaded and then executed
INPUT#	Transmits specified variables to tape
PRINT#	Loads specified variable
RMT OFF	Cancels remote function for second tape recorder
RMT ON	Resets remote function for second tape recorder
COLOR	Specifies color of characters printed
CSIZE	Specifies size of characters printed
GLCURSOR	Moves printer pen from starting point to a specified X,Y coordinate
GRAPH	Enables printer to "draw"
LCURSOR	Moves printer pen to desired location
LF	Line feed
LINE	Printer draws a straight line between two X,Y coordinates
LLIST	List program to printer
LPRINT	Prints specified content (like Print)
RLINE	Draws a straight line using existing pen position as the starting point
ROTATE	Specifies direction characters are to be printed
SORGN	Specifies existing pen location as the new point of origin
TAB	Specifies pen position in Text mode
TEST	Executes color test
TEXT	Enables printer to print characters and numerals

Table 2c. Unique commands of the PC-1500.

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	NAME	DESCRIPTION
1	RULE78	Interest Apportionment by Rule of the 78's
2	ANNU1	Annuity computation program
3	DATE	Time between dates
4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
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ble with. By using the GCursor statement you can direct the cursor to one of the 156 rows of dots (seven dots to a row). From there you can light up any combination of dots in that row with the GPrint statement. GPrint requires a magic number that describes the unique combination you want. Sharp has cleverly assigned the dots a number, starting with one at the top and proceeding downward by powers of two, with the seventh dot being 2^6 or 64.

The magic number is the sum of numbers for dots you want to light. For example, if you want only the top and bottom dots in a particular column to light, use the expression 65 (1+64) for your GPrint statement. Want all the dots? Use 127 (1+2+4+8+16+32+64). If binary is not your favorite poison, you can use a two-digit hexadecimal number. For the first-last dot combination you would enter 41, and for all the dots just plug in 7F.

Rounding out the collection of graphics control characters is the Point function. Point allows you to sort out the mess you made using GPrint by returning the magic number that is in effect for a row of dots. A hint of what the display is good for can be found in Sharp's manual of PC-1500 application programs. There you will find several games with names like Boat Race and Labyrinth Escape that use the display features. I'm still trying to think of a serious software application for this "gee whiz" capability.

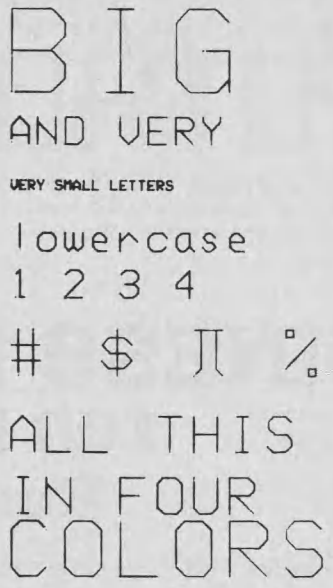

Fig. 1. The CSize command, when used with the CE-150 printer, gives nine different sizes of type, full upper- and lowercase representation, plus special keyboard characters. Printing can be done in any of the printer's four colors.

Cassette Storage

Unless there is only one program in your life, you are going to be very frustrated using the PC-1500 without its companion CE-150 cassette interface and printer. This accessory, which lists for $250, will set you back almost as much as the computer. When you hear about the printer you won't feel so bad though.

First things first: Going from disk to cassette storage seemed like a step into the stone age for me. Then I considered the cost of disk drives and disks plus the fact that the darned things crash if you as much as look at them sideways. Perhaps cassette storage isn't so bad after all. The CE-150 makes the transition easy; reliable and simple are the best words to describe its operation. You'll do minimal tinkering with volume controls and, unlike the Apple cassette interface, the CE-150 does the stop-

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ping and starting. I had no problem using an inexpensive, discount-store variety of cassette recorder; if you really want to go first class consider buying the accessory CE-152 recorder—list price $100.

A handful of special commands help to make the Sharp interface a winner. Chain is just like its disk-based namesake; the program in memory calls up another program from cassette, with the new program taking over after it is loaded. Chain is helpful in beating the memory crunch if your PC-1500 programs get too long. Input# and Print# let you store and retrieve data files—another memory saver if you require large arrays and lots of strings.

The versatility of a single recorder storage system is doubled when you take advantage of the CE-150's ability to control two machines. The record and play audio comes from the same jacks for both machines; what separates them is the presence of two remote signals. Just type RMT On when you want to use the second machine. If later on you need to load or store something with the first recorder, enter RMT Off. Applications for the dual interface are readily apparent: the program on one cassette, the data on the other, and so forth.

Four-Color Virtuoso

If you buy a PC-1500, take along enough money to get the CE-150 cassette interface and printer. The printer is, in a word, nifty. It's an exciting example of how electronics and mechanical devices can be combined for powerful results. Four tiny ballpoint pens slide back and forth across the adding-machine-size paper. The vertical movement is accomplished, not by moving the pens, but by moving the paper up and down. If it sounds simple, don't worry—it is. The smarts behind this printer are in the signals that drive the pen holder and the paper guide.

Because the CE-150 is a radical departure from the daisywheel and dot matrix approaches to printing, the PC-1500's print commands will seem different. You can use either the Text mode (where nine sizes of type are available) or you can drop into the Graph mode (where an X-Y coordinate scheme allows for drawing).

Text commands include the self-explanatory LPrint and LList. LCursor sets the starting position for a line and Tab is just like a typewriter tab when used as part of an LPrint statement.

Sharp Software Modules

Sharp Electronics Corp. will introduce five PC-1500 software modules in late 1982. The modules, which plug into the computer's memory expansion port, include libraries for mathematics, electrical engineering, statistics, finance and graphics.

The mathematics library offers 16 programs, ranging from Fourier analysis to solving linear and nonlinear equations. Sixteen programs are included in the electrical engineering package. Design programs include phase-locked loop analysis, passive and active filters and Smith chart calculations.

Statistics users will find 18 programs, including calculations of "t" and "F" statistics and eight different kinds of distributions. The Sharp finance library has ten programs that include amortization schedules, forecasting and cash flow discounting.

The PC-1500 graphics module is designed to work with the CE-150 printer and provides 13 programs that can be used independently or as part of other programs.

The real crowd pleaser is CSize. It lets you choose a type size as small as 0.05 inches high and 0.03 inches wide or as massive as .42 inches high by 0.28 inches wide. With the giant size you get only four letters to a line; drop down to CSize 1 and you'll cram 36 characters into 1¼ inches.

Upper- and lowercase letter, numbers and the keyboard's special characters like pi and square root are all available. Besides choosing the size of a letter you can select one of four colors with the Color statement. The

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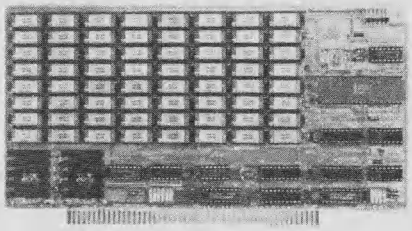

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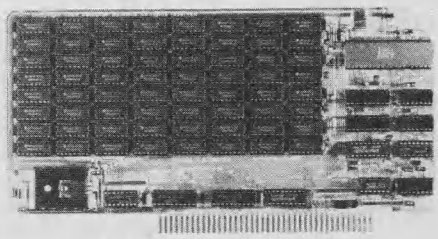

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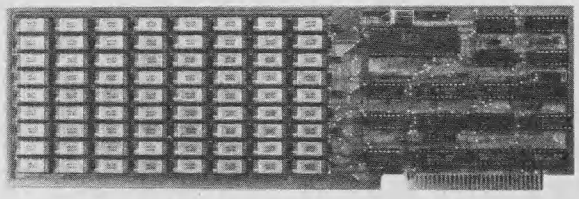

IBM Personal Computer

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The nice thing about Text is that it's easy to use. The Graph mode is a bit tougher to master. But once you do—look out; the PC-1500/CE-150 combination will outwork printer/computer combos that cost a magnitude of ten more. The Graph mode uses Rotate to specify the direction of printing: up, down, left or right. LF (short for line feed) lets you move the paper forward or backward. How many other $250 printers can do that? The forward movement is unrestricted, while backwards travel is limited to about four inches.

Unleashing the Graph power depends on your ability to transfer the desired result into a series of X-Y expressions required by the Line, GCursor and RLine commands. Curved and diagonal lines can be had if you are patient enough to program the computer to perform a multitude of printing steps. Line resolution can be as fine as 0.016 inches.

Only two minor complaints dampen my enthusiasm for the CE-150 printer. The ball point pens dry out if left in the printer. You have the choice of leaving the pens in and replacing them more frequently, or taking them out for proper storage after each use. Second complaint: The printer is so small that it won't accept a conventional roll of adding machine paper. Either buy the special length rolls from Sharp or rig up an external bracket that will hold the garden variety roll.

Circle 319 on Reader Service card.

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Books

A PC-1500 comes with a 164-page instruction manual and a 214-page applications manual. The instruction guide does a nice job of teaching you about pocket computer Basic. Dozens of short example programs are included to show you the way. My only complaint about the instruction guide is its lack of an index—a real pain in the neck when you want to find something in a hurry.

The applications manual offers 51 different programs and includes the operating guides and examples, so programming knowledge is not required. Subjects range from solving first order differential equations to drawing a computer generated flower on the CE-150 printer. Statistical analysis applications are particularly well covered, with a number of the programs taking advantage of the printer's Graph mode. Among the business and home applications is the usual annuity rate calculator and a rather unusual household accounting program. Some of the applications, like the household accountant, require a 4K expansion module, printer and cassette recorder.

Prospective PC-1500 owners may want to invest in the instruction or application manuals before taking the plunge. You can buy them separately from Sharp Electronics Corp., 9 Sharp Plaza, Paramus NJ 07652. The instruction manual is $4 plus $1.50 shipping; the application book sells for $11 plus $1.50 shipping. A service manual, part number SPC-017, is available too, for $5 plus the usual $1.50 shipping.

Work Alikes—The PC-2

Regardless of what Radio Shack and Sharp may state officially, the Sharp PC-1500 and the Radio Shack TRS-80/PC-2 are the same computer. Radio Shack didn't fool anybody when they made slight changes to the keyboard layout. You still get the same number of keys and they perform the same functions. A Sharp owner will be able to use any of the dozen or more software packages Radio Shack plans to release by early 1983. On the other hand, PC-2 owners may want to visit their local Sharp dealer occasionally to see if the selection of program modules that Sharp has promised are out (see sidebar). No matter what the brand name of your pc, consider picking up a PC-2 Quick Reference Card, Radio Shack part number 26-3601. You'll find error message and programming details at your fingertips with this inexpensive accessory.

Both Radio Shack and Sharp intend to release an RS-232 interface for the PC-1500. All you have to do is choose the one with the best price.

Usefulness Factor

Your pocket computer can be used for the same things that you might use a regulation-size home computer for. It can balance your checkbook, teach your kids a new language and entertain the entire family with wholesome computer violence. Best of all, the PC-1500 is portable; balance your checkbook at the beach, learn that new language while flying cross country or play computer games on your next backpacking trip.

Seriously, there are people who can put a pocket computer to good use. Consider the surveyor—PC-1500/CE-150 in hand, she types in a handful of coordinates describing a plot of land. Seconds later the computer returns the acreage and draws an outline of the parcel. A pocket computer is a godsend for a biologist working at an isolated field station. Now the scientist can log data quickly thanks to the computer-cassette combination. And, if need be, immediate interpretation and printout is available. A more intrinsic reward was found by a computer professional who spends a lot of time traveling and missed the solace of his home computer. Now, thanks to the PC-1500, he can program away his homesickness.

I now believe that advertising hype. The PC-1500 is a real computer. True, it has only a one-line display and it takes a bit longer to run programs. It also has a Basic that puts some low-end home computers to shame. Throw in the printer and you get capabilities unrivaled by anything in the same price range. Convinced? Shop carefully; Sharp's PC-1500 is selling briskly and the dealer with the best price just may be out of them when you call.■

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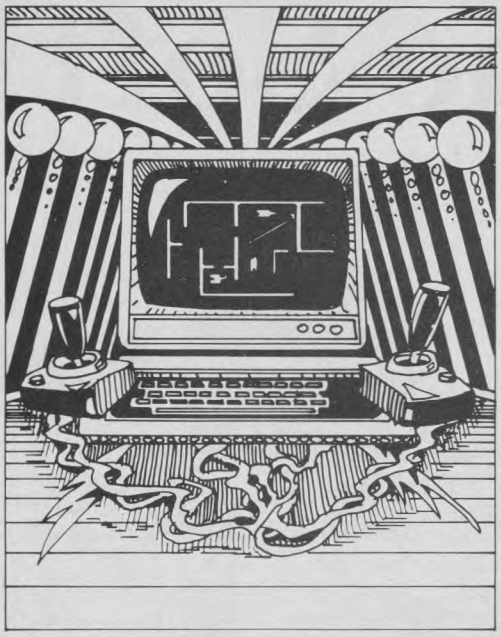


Game Digest

Edited by Dan Muse

ATARI, APPLE

Deadline

System Requirements: Atari, 32K with disk drive; Apple II Plus, 32K; IBM PC
Manufacturer: Infocom, 55 Wheeler St., Cambridge, MA 02138
Price: $49.95
Comments: "Deadline is a fantastic adventure game," the review says. "It provides a sense of close involvement, casting you in the role of a police inspector called in to solve a tough case," according to the review.

"The story line is excellent. It reads like a Micky Spillane mystery," the review says. Deadline goes a step beyond a standard text adventure. You are not the only person actively on the scene. You can talk with a number of people or follow them on their daily routines, the review says.

"Adventurers...should enjoy Deadline for the excitement and involvement it offers," the review says. Reader Service number 405.

(Reviewed in Softside, *Vol. 5, No 11)*

ATARI, PET

The Vaults of Zurich

System Requirements: Atari 400/800, 24K, PET cassette
Manufacturer: Artworx, 150 North Main Street, Fairport, NY 14450
Price: cassette, $21.95; disk, $25.95
Comments: In the Vaults of Zurich, you are a master thief. "To win the game you must journey to and from the lower vaults down a maze of corridors, eluding the most sophisticated security system in the world...the ultimate treasure is on the bottom levels," the review says.

"Each vault contains treasures, from Swiss bank notes to Swiss cheese: tools, keys, drills, plans or explosives, plus people—employees or tourists who must be dealt with before you can proceed," the review says.

You have two hours to reach the lowest level—the chairman of the board's office—and then get back to the top level to escape. Reader Service number 409.

(Reviewed in Softline, *July 1982)*

ATARI

Pac-Man

System Requirements: Atari 400 or 800, 16K, cartridge
Manufacturer: Atari, 1265 Borregas Ave., Box 427, Sunnyvale, CA 94086
Price: $44.95
Comments: "Several books have been written on how to beat the creatures in this game. Too bad; none of those patterns apply to this version," the review says.

The game can be played on any of eight levels. Beginners can start on the slow cherry level, and advanced Pac-Maniacs can battle on the much-touted key level. The speed of both Pac-Man and the monsters varies on the different levels, the review says.

"Atari's version attempts to duplicate the original arcade game in every detail and Pac-Man looks and sounds like Pac-Man should," according to the review. Reader Service number 402.

(Reviewed in Softline, *July 1982)*

APPLE

Gold Rush

System Requirements: Apple II, Apple II Plus, 48K, disk
Manufacturer: Sentient Software, Box 4929, Aspen, CO 81612
Price: $34.95
Comments: "Gold Rush is a new computer game that puts you in another place and time in search of one of the world's most precious treasures, while battling barbarians in the wilderness," the review says.

"Your mission is to find the gold and bring it to waiting mining cars. But the stakes are high, and you have to outmaneuver your enemies at every turn to avoid getting killed or robbed," according to the review.

"The authors of this program have designed a game that will keep you on the edge of your seat. You can't go wrong; you'll love it," according to the review. Reader Service number 403.

(Reviewed in Softline, *July 1982)*

APPLE

Beer Run

System Requirements: Apple II or II Plus with 48K and one disk drive (DOS 3.2 or 3.3)
Manufacturer: Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827
Price: $29.95
Comments: "Beer Run is a hearty brew of a game," the review says. The object of the game is to find and catch the elusive Artesians, according to the review. You accumulate points by collecting beers. The player must avoid the Guzzlers and the Bouncers. "If your runner comes into contact with either, the runner plummets to his death—you are given three runners per game," the review says.

"Beer Runner is witty, well thought out and well executed. The musical sound effects are coordinated to your on-screen fortunes and add a comic relief to the proceedings," the review says. Reader Service number 408.

(Reviewed in BYTE, *September 1982)*

APPLE

Othello

System Requirements: Apple II, 48K
Manufacturer: Micro-Sparc Inc., PO Box 325, Lincoln, MA 01773
Price: $19.95 plus $1.50 shipping/handling
Comments: If you are "tired of all those space games where all that is required are quick reflexes and a fast trigger finger," but which offer no mental stimulation, Othello may be for you.

The game is played on an eight-by-eight board. The pieces used in this computer game are green on one side and orange on the other. "Each player takes turns putting pieces on the board, trying to capture the opponent's pieces. You capture pieces by flanking your opponent's pieces with your own," the review says. For example, if there is an orange piece followed by three green pieces on the board, placing an orange piece after the three green ones changes them all to orange.

"The game becomes exciting by sudden reversals in the lead—you may have six pieces more than your opponent when suddenly with one move, you are seven pieces behind," the review says. Reader Service number 428.

(Reviewed in Nibble, *Vol. 3, No. 5)*

APPLE

The Pursuit of the Graf Spee

System Requirements: Apple II or Apple II Plus with Applesoft in ROM, 48K, disk drive
Manufacturer: Strategic Simulations, 465 Fairchild Drive, Suite 108, Mountain View, CA 94043
Price: $59.95
Comments: The game derives its name from the sinking of a German pocket battleship, the Graf Spee, during World War II. "Even if it's an obscure event, it makes a dandy computer game," the review says.

"As the British commander, you have two aircraft carriers, four heavy cruisers, five light cruisers and the battle cruiser Renown with which to find and sink the marauder," according to the review.

"In combat, the Graf Spee is vastly superior to any of the Allied ships except the Renown," so the player must use strategy and tactics to defeat the enemy, the review says. Reader Service number 401.

(Reviewed in Softline, *July 1982)*

APPLE

Star Blazer

System Requirements: Apple II, Apple II Plus, 48K, disk
Manufacturer: Broderbund Software, 1938 Fourth St., San Rafael, CA 94901
Price: $31.95
Comments: "World War III is over and the Milky Way is in the grip of the repressive Bungeling Empire. Only one hero can save the galaxy now, and that's Star Blazer..." the review says.

You (Star Blazer) are asked to "fly a dredged-up World War III jet against a radar installation, a pair of supersonic tanks, an ICBM installation and, finally, the Bungeling Empire headquarters," the review says. Reader Service number 404.

(Reviewed in Softline, *July 1982)*

APPLE

Wizardry

System Requirements: Apple II or Apple II Plus, 48K with one or more disk drives, DOS 3.3
Manufacturer: Sir-Tech Software, 6 Main St., Ogdensburg, NY 13669
Price: Scenario 1: Proving Ground of the Mad Overlord—$49.45
Scenario 2: The Knights of Diamonds—$34.95
Comments: "It is inadequate to call Wizardry a game. An 'experience' is a much more suitable label," the review says. Wizardry consists of two scenarios: Proving Ground of the Mad Overlord and The Knights of Diamonds.

"The player may create as many as 20 characters per disk, and may make as many scenario disks as he likes," the review says. "Successful characters may be transferred from one scenario to the next," according to the review.

"Never shall you be faced with a dull moment. The character generation—maze mapping—combat—spell casting—why, it's all Wizardry," the review says. Reader Service number 406.

(Reviewed in Softside, *Vol. 5, No 11)*

APPLE

Zero Gravity Pinball

System Requirements: Apple II with 48K; Applesoft in ROM or language card, one disk drive, DOS 3.3 or 3.2, game paddle 0
Manufacturer: Avant-Garde Creations, PO Box 30160, Eugene, OR 97403.
Price: $29.95
Comments: "Zero Gravity Pinball is an original and unique game that makes excellent use of the Apple's graphic capabilities. It may be one of the best tests of eye-hand coordination around, as well as being a lot of fun," the review says.

"The levels of play range from 1 (slow) to 5 (masochists only)," the review says. "Once you've accumulated 50,000 or more points with the five balls you are allotted, it's time to move up to the next level of difficulty, because a score of more than 64,000 points ends the game," according to the review.

"The quality of the graphics and animation is excellent," and the sound and color are good, according to the review. Reader Service number 407.

(Reviewed in BYTE, *September 1982)*

Learn the Password To This Arabian Nights' Adventure

Ali Baba and the Forty Thieves

An Arabian adventure
Complete with
Elves, halflings and dwarfs

If you have ever dreamed of finding great treasures of gold, fighting battles against evil and rescuing a fair princess, Ali Baba and the Forty Thieves may be the adventure game for you. It uses high-resolution graphics and sound, as well as text, to take you on your journey.

The main goal of this adventure is to rescue the Sulton Shahriar's daughter, the Princess Buddir-al-Buddoor, from the thieves who have abducted her and stashed her away somewhere in the thieves' mountain. I say main goal because while you are investigating the different rooms and finding all the treasures, it is easy to forget why you are there.

This adventure was made for those who do not want to read a long manual, but just want to load and go. After the program is loaded you simply follow the prompts on the screen and begin. The program also outlines the different objects in the room for the first several turns to help you in determining what each item is. Its description can be found in the text window.

There are 17 alter egos that you can use which makes this game playable for up to 17 adventurers at one time. If you want to play solo you have the option of controlling up to 17 characters by yourself. At your command are humans, elves, halflings and dwarfs. All have unique characteristics which enable them to be helpful in different situations. In the 100 plus hours that my wife, friends and I have invested in this adventure I have learned not to go anywhere without Jatte, the strongest dwarf of the Sultan's Elite Corp. He has become an invaluable asset to me when battling thieves, dragons and enchanted statues.

As in most adventures, there are many clues to aid you in your task. There are owls who prefer to run rather than fight, and will quite often flee through a secret passage which is unseen to the adventurer. You will also find rune writings to aid you. To read them simply move your character onto the rune and the message will appear on the screen in an Arabic font with music to add to the setting. The writings are very useful and are often very cryptic (to rescue the princess unaided attack only the unseen).

This adventure was made for those who do not want to read a long manual, but just want to load and go.

On occasion the rune will burst into flames after you have read it and may injure the adventurer. Should this happen you need only to use the rest option provided on the screen and the character will heal and regain his strength. Use this option whenever possible as you will need your full strength for the many battles you will have. You can monitor your character's health, wealth, power and other useful traits through the use of the many options available to you.

As with most other adventures, there are many areas to investigate. There are wandering monsters, enchanted statues, thieves and dragons that are programmed to keep you from succeeding in your task. You can usually determine your level of the mountain (there are four) by the type of wandering monster that you encounter. They may wander about a level but not between the levels. You can also stop into a trading post where you may buy armor and weapons for battle. The price for these items will double, triple and quadruple on each successive level. The weapons and armor are also more powerful when purchased on the upper levels so if you can amass large amounts of gold it will pay to wait until you reach the higher levels.

This adventure is not the kind that once solved will be relegated to the drawer to collect dust. It has variables such as the wandering monsters which can appear anywhere on their level. It offers a rather unique feature—the monster rebirth rate. With this you can select the rate at which the evil beings you slay are reborn to fight you again. Also, in an effort to keep things reasonably fair you can reincarnate any of your players. You can also add a player and have him start in the same room with you. These are two of the most valuable options in this game.

This game will probably not be solved in the first sitting, so the save-game feature comes in very handy. The 24-page manual is well written and useful as a reference as the game progresses. Also this program is not sexist; there are both male and female characters to choose from.

This is a very good fantasy/adventure game. It is easy enough for the beginner adventurer to learn and difficult enough for the seasoned adventurer. The game is available for the Apple II, and Apple II Plus, with 48K; and for the Atari with 32K. *(Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335. $32.95)*

Richard D. Prill
Pompano Beach, FL

Juggler

A fun-filled
But nonviolent
Game for kids

Juggler will probably appeal mostly to children under 12 years of age. As the game implies, the object is to juggle objects. How long? As long as you can. Your reward? Points.

Each game allows three jugglers. Balls, pins and something else I couldn't recognize are to be juggled. The game begins by selecting a skill level. Six objects are then shot into the air, one at a time. Once all are up, they gently bump into each other and slowly float down.

Your job is to position a juggler under the objects. The juggler throws various "magic beans" (size and height depending on skill level) into the air which knock the juggled objects back up. If one of the balls or pins hits the ground, action stops (with what sounds like a Bronx cheer) and the next juggler is brought out.

The game can be controlled by either keyboard left-right arrows or a game paddle. The game paddles work better for me, since the juggler stops at the setting of the knob anywhere in the playing area. When the keyboard is used, he starts moving in the direction of the arrow key, but only stops when the game boundary is reached or the opposite arrow key is hit; this is slightly more difficult.

Animation and sound effects (which can be turned off) are generally good. The sounds chosen for this game seem particularly appropriate. The jugglers have only two postures; these alternate as the juggler moves side to side giving a walking effect. A circus tent is used for a backdrop.

The action of the game has some interesting aspects. Apparently this game is taking place on the moon, or else the laws of gravity have been repealed. The juggled objects float down like feathers—most of the time. On one occasion I found three balls hanging in space, side by side, for nearly five seconds.

Also, the elastic modulus of the balls and pins is something out of the ordinary because they can bang against each other for long periods of time without apparent loss of energy.

I like the prompt during boot describing how to make a "sterile" copy of the disk. Undoubtedly some people will spread a few bootleg copies around but for us law abiding types, being able to get a backup copy with a routine built into the game is certainly an asset. Thanks, IDSI, for both the courage and consideration.

As an adult, I did not find the game one which I would like to play very often. Game action is relatively slow, and the reward for excellence is only a slowly accumulating score next to the timer. (If you have one juggler on the field for more than 60 seconds, the game automatically moves you to the next skill level.)

However, if you have kids in the 12-and-under-age group that have access to your Apple, I think this is a good, nonviolent game which belongs in their library; my kid-game testers gave it an excellent rating. *(Innovative Design Software, Inc., PO 1658, Las Cruces, NM 88004. $34.95)*

Jim Hansen
New Boston, NH

> . . . kid-game testers gave (Juggler) an excellent rating.

Shuffleboard

Caroms and collisions
Abound in this
Game for Apple II

Shuffleboard, as the name implies, is a version of sidewalk shuffleboard adapted for use on an Apple II. Not being a sidewalk shuffleboard player myself, I cannot vouch for the authenticity of this version, but it seems to match fairly closely the shuffleboard games I've played at the local pub.

The game is done in high resolution graphics and features sound effects simulating (nicely, I thought) pucks in collision and going over the side. A cheery "TA-TAA!" is sounded whenever a puck hangs over the outside borders scoring extra points. The computer seemed able to do this more often than I could.

The game begins by placing an overhead view of a shuffleboard court on the screen, accompanied by a short musical fanfare. If requested, a demonstration of shuffleboardery is run: the computer shows a collection of shots, nothing too out of the ordinary.

Two versions of the game, Tally All or Cutthroat, may be played. The primary difference is in the scoring. Cutthroat, which sounds more interesting, is my favorite. In this game turns are alternated, and the player with the puck closest to the far end is the only one to score. Only those pucks beyond any of the opponent's are counted. So the strategy here is to be the one with a puck hanging over the far end, and hopefully a few more beyond the competition's.

Shuffleboard also allows two humans to play, but the computer is plenty of competition with the added advantage of not having to wait between shots while someone figures his next one. Typing a "U" or "D" (for up or down) moves both the puck and aiming cursor up or down (side to side on the court); the left and right arrow keys are used to move only the cursor. An added piece of class here is that the cursor actually moves in an arc whose center is the middle of your puck. A clear plastic ruler is useful in precisely aiming your shots.

After you have lined up your shot a space is typed. This starts an asterisk moving between "slow-medium-fast" on the speed selector. As you can clearly imagine, tightly controlled velocity on your puck would give incredible and boring accuracy. The velocity in Shuffleboard is selected by simply typing an "S" after the space. The asterisk stops at its current location and the puck is launched. This way you don't get to choose the speed exactly, and human variables actually control your side of the game.

This is not so for the computer. It basically doesn't miss, and seems to delight in bashing your pucks around or hanging one of its own over the outside corner of the 4 square.

The game is fun, and when you augment your aiming with a ruler to line up your pucks, the computer has its hands—or should we say algorithms—full. I have had no trouble—errr, on occasion that is—in knocking three of the computer's pucks off the board by caroming my last shot just right. (Of course, I wouldn't want to explain how I got in that position in the first place!)

The manual packed with Shuffleboard is an attractively printed seven-page booklet that simply and clearly outlines Shuffleboard and how to run it. The first paragraph of the warranty statement indicates that IDSI isn't going to be held responsible if you lose money wagered on this game. They seemed pretty serious about it, but I found the idea of someone suing them for betting and losing on a game like this rather humorous.

The game is fast, satisfying, and has a good manual and good human engineering. Kid-wise, I would say it is most likely to appeal to analytically minded young adults over 12 years of age. IDSI is to be thanked for providing a built-in routine for generating backup (sterile) copies of the disk, a convenient and thoughtful feature for their customers. I liked Shuffleboard and think you will too. *(Innovative Design Software, Inc., PO Box 1658, Las Cruces, NM 88004. $34.95)*

Jim Hansen
New Boston, NH

A Serious Game Machine

The Atari 400 has all the tools—sound, color and graphics capability, as well as an abundance of software—to outfit the game gladiator for combat.

By Richard D. Prill

The sound, colors and graphics of the Atari 400 make it perfect for the serious gamester. It is the next step for those who want to graduate from TV games systems.

When you bring your Atari 400 computer home, the ease of setting it up may astound you—especially if this is your first home computer. The Atari 400 comes with a power supply and a TV/computer switch box. The power supply just plugs into the wall. You place the other end of the cord into the power jack on the side of the computer. The TV/computer switch box connects to the VHF inputs on the television. It is switchable so that the same television can be used for both the computer and regular viewing without having to disconnect and reconnect cables. Having a TV is a necessity because the Atari 400 cannot be used with a video monitor.

After the unit is hooked up and the TV is turned on to channel 2 or 3 (whichever is not used in your area), you will see a blue screen and the words Atari Computer Memo Pad. On this you may type messages and learn to use the editing control key to help familiarize yourself with the keyboard. Other than that I have found no other use for it because what is typed cannot be saved and recalled later.

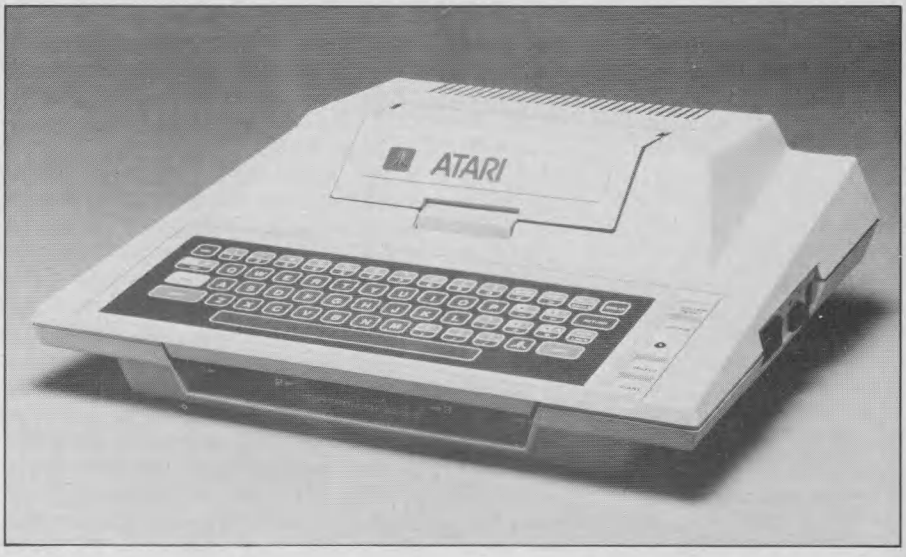
The Atari 400 does not come with a language cartridge so if you plan to use the 400 with anything except plug ROM programs you will need to buy one separately. These cost about $60 and should be available where you purchased your computer. Atari has a kit called the Programmer which contains the Basic cartridge, the Atari Basic reference manual and a self-teaching book on Basic.

With the Basic cartridge in place you are ready to learn, or program, in Basic. The language is fairly clear and easy to learn at the beginning. It does get more difficult as you advance, but one of the advantages of Basic is that you don't have to be an advanced student to write useful programs. The Atari Basic error codes will normally put you on the right track should you make a mistake.

Atari is highly praised for its graphics and rightfully so. The Atari 400 is capable of some fantastic graphics which enhance both adventure and arcade games. It has a high resolution of 320 × 192 pixels (blocks available on the screen). The Atari 400 also has the capability to produce 16 colors at 16 intensities, giving it 256 color capability. The 400 can also produce a wide variety of sounds ranging from bombs exploding to birds singing. These capabilities make the Atari 400 a formidable challenger in the computer gaming market.

The Entertainer kit by Atari is a must for the game player. It contains joysticks and two plug-in ROM game cartridges, usually Star Raiders and Missile Command. Star Raiders by itself is almost enough reason to buy an Atari 400. This game is interesting, action-packed, demanding, and makes full use of the sound and graphics capabilities of the computer.

Two other "kits" are available from Atari at present. They are the Communicator and the Educator. The Communicator comes with an Atari 850 interface module, Telelink I cartridge and an Atari 830 Acoustic modem. With this kit the world of



For the beginning game player, the Atari 400 is a perfect choice.

Address correspondence to Richard D. Prill, 5229 NE 18th Terrace, Pompano Beach, FL 33064.

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telecomputing is opened to you. You can access databases such as the Source, CompuServe, Dow Jones stock information service and a multitude of other databases. They can usually be accessed through a local phone number and offer such items as newspapers from around the country, electronic mail and shopping and games.

The Educator package contains an Atari 410 cassette program recorder, the Basic language cartridge and an educational cassette called States and Capitals. Take note that if you already own the Atari Basic cartridge, buying this kit will be an unnecessary expense. You will want to purchase a 410 recorder and they are available separately for about $90.

Add-on peripherals for the Atari are numerous. The 410 program cassette recorder, as mentioned above, is used for loading and saving programs to cassette tape. You cannot use a common cassette player due to the special built-in cable attached.

Atari also has a disk drive, the Atari 810, which is available for about $600. It uses 5¼ inch single-density, soft-sectored, floppy disks. The disk system allows you to save and load data at a rate of speed far above that of the 410 recorder. As you become more serious about your computer, you will find that a disk drive is a must.

> Atari has many programs available for its computers in cartridge, cassette and disk form.

One of the most important things to consider before buying a computer is software availability. Unless you can program it yourself, it will do you no good without commercially available software. Atari has many programs available for its computers in cartridge, cassette and disk form. In addition, there is the Atari Program Exchange (APX) where third party programs are available through catalogs. Many of them are quite good and all are reasonably priced. They are rated and their use is explained in the catalog. In addition they tell you what type of equipment is needed to run the program.

There are many software houses releasing programs for the Atari from simple educational games for children to sophisticated business programs. Arcade game players will probably not be able to keep up with the amount of games available.

Another type of game available for the Atari is the adventure game, to which I devote most of my computer time. These are role playing games where you assume the character's identity and go off to do great things such as rescue princesses, slay dragons and find great treasures. Some are text-only adventures and more recently they have been released with sound and graphics. The only drawback to these is that they normally require a minimum of 24K. The Atari 400 can be upgraded to 48K with boards by other manufacturers, but this will immediately void your warranty, so wait until it expires before you upgrade.

I believe you will find the Atari 400 one of the best in its price range. ■

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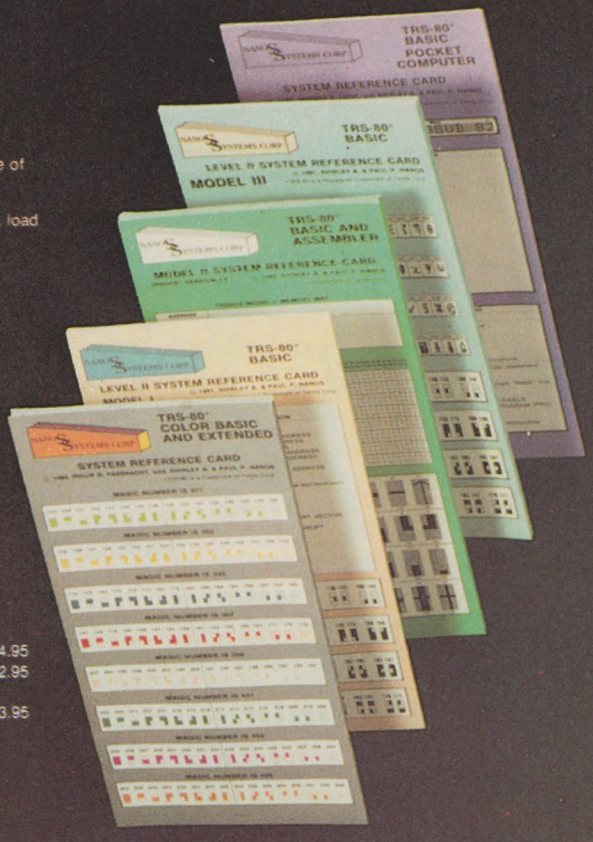

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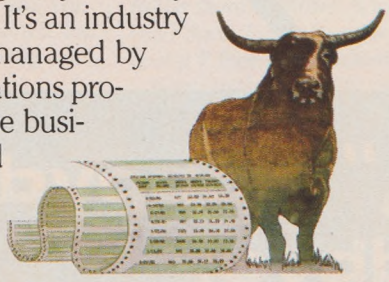

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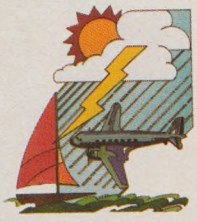

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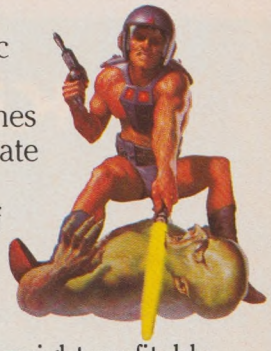

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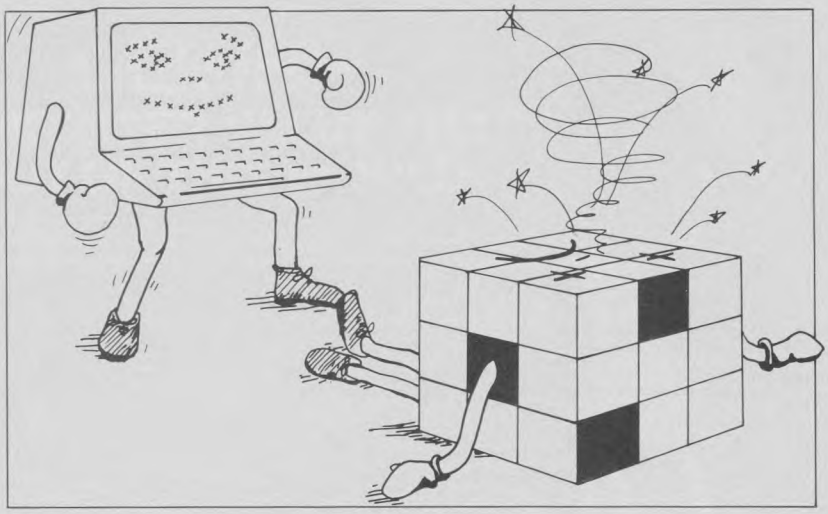
Conquering the Cube

By Jim Hodsdon

Does your cube have you beat? This month's Rubik's Cube simulation and solution is for the Heath computer.



It has been my basic philosophy that, given enough time and money, one can make a computer do anything. So I decided that, instead of spending from $5 to $9 on a gimmick, I would program my poor unsuspecting H8 computer to simulate a Rubik's Cube for me.

The program, written in Benton Harbor Extended Basic, has grown to over 700 lines, not including comments, and will solve a scrambled cube for you. I call it Autosolve.

The first step was to decide upon some systematic notation for the nine squares on each face of the cube. My approach has been to use numbers since that seems to be what a computer is best at.

The center square of each face is numbered 0.

Now to number the rest of the squares. Using the face that faces you as you contemplate the cube, start with the left top corner and go clockwise, numbering each face square from 1 to 8.

Just to be logical I assigned "+" to designate clockwise and "–" counter-clockwise.

In a problem of this sort it seems best to develop as much symmetry as possible. The unlucky cube's three-dimensional structure imposes a limitation: when the relationship between adjoining faces is made symmetrical, the relationship between the opposite faces cannot be made so . . . and vice versa.

The following scheme seems to work out fairly well. First, a definition for the faces:

- Facing you is the front face, designated F;
- The face to the right is R;
- The face to the left is L;
- The face behind is B;
- The face on top is U (for Up);
- The face on the bottom is D (for Down).

The following numbering system will serve as a guide in entering a cube configuration for the program, or solving it: The numbering of the F face is described above. When this is done, turn the cube 90 degrees to your left. This brings the R face to the front. Number it exactly as you did the F face. Turn the cube back 90 degrees so the F face is to the front.

Now tip the cube 90 degrees forward to put the F face on the bottom. The U face is now facing you. Number it the same way as the others. Now tip the cube back 90 degrees so the F face is again facing you.

Now turn the cube 180 degrees to the left. This brings the B face to the front. Number it exactly as you have the others. Turn the cube left 90 degrees so the L face is to the front. Yes, number that the same.

Turning the cube another 90 degrees to the left brings the F face back to the front. Tip the cube 90 degrees back so that the F face is on top. Now you can number the D face, which is facing you.

AutoSolve

In what I hope is a good structured programming technique, the solution is broken down into a number of steps:

The first step is to position the "edgies" on the U, or upper face. This results in a cross pattern. Squares numbered U-2, U-4, U-6 and U-8 are moved into place.

The second step is to position the corners of the upper face: U-1, U-3, U-5 and U-7. This completes the upper layer.

The next stage is to fill in the middle horizontal band. This is done in two steps. The first is to reposition, if necessary, any edgies that are already in the middle band but not where they belong. The next step is to move any strayed edgies from the bottom layer into their proper places.

The last stage involves only the bottom layer. The first step of this stage is to get the corners into their proper locations but not necessarily in proper orientation. Then do the same for the edgies. The third step is to "twirl" the corners and the last is to "flip" the edgies as required to form the perfect cube. Voila! The cube is solved.

Notes on Operating KUBE

The entry for a move should be in the form (sign) (face code) (number).
(sign) is + for a 90-degree clockwise rotation, – for a 90-degree counter-clockwise rotation.
(face code) is a single letter for the face to be rotated.
(number) can be blank, 1, 2 or 3.

- Blank defaults to 1.
- 1 represents a 90-degree rotation.
- 2 represents a 180-degree rotation. (The sign doesn't matter in this case.)
- 3 is equivalent to a 1 with the opposite sign.

Last month's "Conquering the Cube" article was submitted by Kenneth Cooper, 1108 Clevenger Road, Ontario, N.Y. 14519.

Address correspondence to Jim Hodsdon, Fox Run Lane, RFD 3, Newtown, CT 06470.

Three more moves, in addition to the face moves, are available:

- H rotates the horizontal mid-band clockwise front to left.
- V rotates the front vertical mid-band clockwise front to up.
- S rotates the side vertical mid-band clockwise left to up.

Notes on the Program

None of the REM statements are required to run the program.

With all possible spaces squeezed out, the program requires slightly more than 32K bytes of memory on the H8 with the Benton Harbor Extended Basic; 40K bytes should handle it. If you have only 32K bytes of memory, you can run by separating the last portion of the program starting with statement 8000.

This section handles the input for your own cube configuration and can be chained in when needed.

To chain the last section make the following changes to the program:

- Change statement 310 from GOSUB to a chain command.
- Drop out statements 8200 to 8220.
- Change statement 9360 from RETURN to CHAIN "KUBE", 330.

The array K$(N,M) is the mainstay of the program. Each element contains the original color code and position number of the square currently at the location designated by the subscripts N and M. N indicates the face and M indicates the position on that face.

The S$(array contains sequences of moves designed to change the position of specific squares with a minimum of disturbance to the rest of the cube.

Autosolve uses these sequences by positioning the squares so that an appropriate sequence can be used. For example, to move a square from the bottom layer to front 4, right 4, back 4 or left 4, four steps are required.

1. The middle layer is rotated with +H to bring the desired destination square to position front 4.
2. The square to be moved is maneuvered to position front 6.
3. +X16 is executed.
4. Finally the middle layer is returned to its original location with −H.

You can see how these sequences operate by starting with the standard "perfect cube" and entering the X code. You may add your own sequences by changing the value of SO and the DIM for S$(in statement 90. The program allows a maximum of 99 and there is room to add these after statement 164.

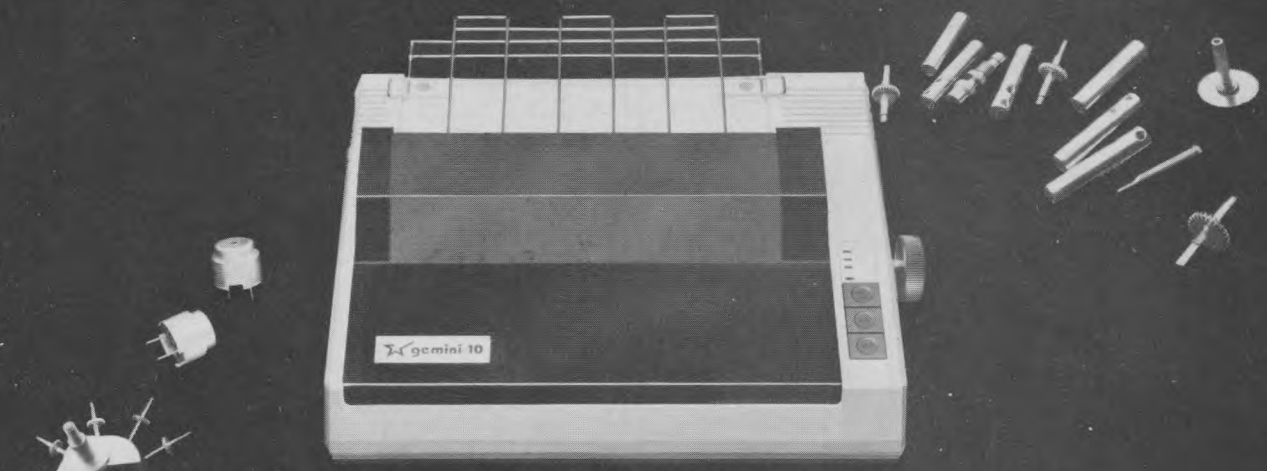
If you would like to change any already-defined sequences, do not change the function of the ones used by Autosolve. They are referenced in the section 3300 to 7280.

The program is made up of separate sections for each function. These can be identified by the REM statements before each section.■

Program Listing. Solving Rubik's Cube in Benton Harbor Extended Basic.

```
00004 REM ************************************************************
00005 REM ***  KUBE - A program to simulate AND SOLVE Rubik's Cube  ***
00006 REM ***                  Jim Hodsdon                         ***
00007 REM ***            Benton Harbor Extended BASIC              ***
00008 REM ************************************************************
00009 REM
00010 DIM K$(5,8), M$(8), X$(8), X1$(5), J$(5)
00017       REM
00018       REM  *****  Standard Face notation
00019       REM
00020 J$(0)="F": J$(1)="R": J$(2)="U": J$(3)="B": J$(4)="L": J$(5)="D"
00030 FOR N = 0 TO 5 : X$(N) = J$(N) : NEXT N
00040 X$(6) = "H" : X$(7) = "V" : X$(8) = "S"
00087       REM
00088       REM  *****  Special 'X' code sequences
00089       REM
00090 SO = 32 : DIM S$(32) : X0 = 0 : M0 = 0 : P0 = 0
00100 S$(0) = "+62+72+82"
00102 S$(1) = "+21+61-51" : S$(2) = "+11+71-41" : S$(3) = "+01+81-31"
00108 S$(4) = "+01-21+11+21": S$(5) = "+32+52+02" : S$(6) = "+12-51+02"
00114 S$(7) = "+42+51+02" : S$(8) = "-31+52+31-51-01+51+01"
00118 S$(9) = "-31+52+31-11+51+11" : S$(10) = "-31-51+31+51+01-51-01"
00122 S$(11) = "+01+51-01" : S$(12) = "-11-51+11"
00126 S$(13) = "-11+51+11+52-11-51+11"
00128 S$(14) = "-31-51+31" : S$(15) = "-81+11+81"
00132 S$(16) = "-51-11+51+11+51+01-51-01"
00134 S$(17) = "+51+41-51-41-51-01+51+01"
00136 S$(18) = "-01+51+01+51+41-51-41+52-11+51+11+51+01-51-01"
00138 S$(19) = "+01+52+41-51-41+52-01+51+01+52+41-51-41+52-01"
00140 S$(20) = "-01+52-11+51+11+52+01-51-01+52-11+51+11+52+01"
00142 S$(21) = "-01+51+31-51+01+51-31+52"
00144 S$(22) = "-51-31-51-41+51+41+31"
00146 S$(23) = "+41-21-41-31-21+31+51-31+21+31+41+21-41-51"
00148 S$(24) = "+41-21-41-31-21+31-51-31+21+31+41+21-41+51"
00150 S$(25) = "+41-21-41-31-21+31-52-31+21+31+41+21-41-52"
00152 S$(26) = "+12-51+31-01+12-31+01-51+12"
00154 S$(27) = "-31-51+21+12+52+22-41+51+41+22+52+12-21+51+31-51"
00156 S$(28) = "-31-51+21+12+52+22-41-51+41+22+52+12-21+51+31+51"
00158 S$(29) = "-31-51+21+12+52+22-41+52+41+22+52+12-21+51+31+52"
00160 S$(30) = "+41-51-11+51-41-51+11+51"
00162 S$(31) = "+42+12-21+42+12+52+42+12-21+42+12"
00164 S$(32) = "-41-01-51+01+51+42+31+51-31-51-41"
00197       REM
00198       REM  *****  Position numbers
00199       REM
00200 M$(1) = "1" : M$(2) = "2" : M$(3) = "3" : M$(4) = "4"
00210 M$(5) = "5": M$(6) = "6": M$(7) = "7": M$(8) = "8" : M$(0) = ")"
00217       REM
00218       REM  *****       MENU
00219       REM
00220 PRINT:PRINT:PRINT:PRINT "YOU HAVE THE FOLLOWING OPTIONS: ":PRINT
00230 PRINT "1 - Start with a perfect Kube, with standard notation"
00240 PRINT "2 - Start with a perfect Kube, with ur own color notation"
00250 PRINT "3 - Continue with a previously saved configuration"
00260 PRINT "4 - Enter a configuration to start with" : PRINT
00270 INPUT "Please enter the number of an option > ";Q$
00280 IF LEFT$(Q$,1) = "1" THEN 410
00290 IF LEFT$(Q$,1) = "2" THEN GOSUB 7300
00300 IF LEFT$(Q$,1) = "3" THEN GOSUB 7500
00310 IF LEFT$(Q$,1) = "4" THEN GOSUB 8000
00320 IF LEFT$(Q$,1) <> "3" AND LEFT$(Q$,1) <> "4" THEN 380
00327       REM
00328       REM  *****  Go to AUTOSOLVE
00329       REM
00330 PRINT  : INPUT "Do u want Autosolve ? > ";Q1$
00340 IF LEFT$(Q1$,1) = "N" THEN 380
00350 IF LEFT$(Q1$,1) <> "Y" THEN 330
00360 GOSUB 600
00370 GOTO 3300
00380 IF LEFT$(Q$,1) = "2" THEN 410
00390 IF LEFT$(Q$,1) = "3" OR LEFT$(Q$,1) = "4" THEN 500
00400 PRINT Q$;" is not a good option." : GOTO 220
00407       REM
00408       REM  *****  Add position numbers to square codes
00409       REM
00410 FOR N = 0 TO 8
00420    K$(0,N)=J$(0)+M$(N): K$(1,N)=J$(1)+M$(N): K$(2,N)=J$(2)+M$(N)
00430    K$(3,N)=J$(3)+M$(N): K$(4,N)=J$(4)+M$(N): K$(5,N)=J$(5)+M$(N)
00440 NEXT N
00500 GOSUB 600
00503       REM
00504       REM  *****  Enter Ur move, or:
00505       REM  *****    A = Go to AUTOSOLVE
00506       REM  *****    N = Display number of moves since start
00507       REM  *****    S = Save present configuration
00508       REM  *****    Q = Quit
00509       REM
00510 INPUT "Enter Ur move, or  A, N, S, Q > ";Z$
00520 IF LEFT$(Z$,1) = "+" OR LEFT$(Z$,1) = "-" THEN GOSUB 800
00530 IF LEFT$(Z$,1) = "Q" OR LEFT$(Z$,1) = "S" THEN GOSUB 7800
00540 IF LEFT$(Z$,1) = "Q" THEN STOP
00550 IF LEFT$(Z$,1) = "S" THEN 7700
00560 IF LEFT$(Z$,1) = "N" THEN GOSUB 7800
00570 IF LEFT$(Z$,1) = "A" THEN 3300
00580 GOTO 500
00597       REM
00598       REM  *****  Display the Cube
00599       REM
00600 PRINT
00610 PRINT"                        Back                                ";
00615 PRINT"          Up"
00620 PRINT"                  *-----------------*                       ";
00625 PRINT"*-----------------*"
00630 PRINT"           /  !  ";K$(3,3);"    ";K$(3,2);"    ";K$(3,1);
00635 PRINT" !              /  ";K$(2,1);"    ";
00637 PRINT K$(2,2);"    ";K$(2,3);" /  !"
00640 PRINT"          /  ";K$(4,1);" !  ";K$(3,4);"   (";
00642 PRINT K$(3,0);"    ";K$(3,8);" !";
00645 PRINT"          /  ";K$(2,8);"   (";K$(2,0);"    ";K$(2,4);
00650 PRINT" /  ";K$(1,3);" !"
00660 PRINT"     /  ";K$(4,2);" ";K$(4,8);" !";
00665 PRINT"  ";K$(3,5);"    ";K$(3,6);"    ";K$(3,7);" !";
00670 PRINT"          /  ";K$(2,7);"    ";K$(2,6);"    ";K$(2,5);" /";
00675 PRINT"  ";K$(1,2);" ";K$(1,4);" !"
00680 PRINT"  *  ";K$(4,3);"(";K$(4,0);"  ";K$(4,7);
00682 PRINT " .- - - - - - - -*";
00685 PRINT"        *-----------------*  ";K$(1,1);"(";
00687 PRINT K$(1,0);" ";K$(1,5);" *"
00690 PRINT"  !  ";K$(4,4);" ";K$(4,6);" /";
00695 PRINT"  ";K$(5,7);"    ";K$(5,6);"    ";K$(5,5);" /";
00700 PRINT"           !  ";K$(0,1);"    ";K$(0,2);"    ";K$(0,3);" !";
00705 PRINT"  ";K$(1,8);" ";K$(1,6);" /
00710 PRINT"  !  ";K$(4,5);" /   ";K$(5,8);"   (";
00712 PRINT K$(5,0);"    ";K$(5,4);" /";
00715 PRINT"           !  ";K$(0,8);"   (";K$(0,0);"    ";K$(0,4);
00720 PRINT"  !  ";K$(1,7);" /
00730 PRINT"  !  /  ";K$(5,1);"    ";K$(5,2);"    ";K$(5,3);" /";
00735 PRINT"           !  ";K$(0,7);"    ";
00737 PRINT K$(0,6);"    ";K$(0,5);" !  /
00740 PRINT"  *-----------------*                    ";
00742 PRINT "*-----------------*"
00750 PRINT"          Down                                        Front"
00760 P0 = 0
00770 RETURN
00797       REM
00798       REM  *****  Rotate cube faces and edges
00799       REM
00800 Q = 1
00810 IF LEFT$(Z$,1) = "-" THEN Q = 3
00820 Q1 = 1
00830 IF MID$(Z$,2,1) = "X"  THEN 880
00840 P0 = P0 + 1
00850 IF P0 < 19 THEN 870
00860 P0 = 1 : PRINT
00870 PRINT Z$ + " ";
00880 IF LEN(Z$) = 4 THEN 990
00890 IF LEN(Z$) = 3 THEN Q1 = VAL(MID$(Z$,3,1))
00900 IF Q1 < 4 THEN 930
00910 Q1 = Q1 - 4
00920 GOTO 900
00930 IF Q1 = 0 THEN RETURN
00940 IF Q1 < 2 THEN 990
00950 IF Q1 = 2 THEN Q = 2
00960 IF Q1 <> 3 THEN 990
```

More →



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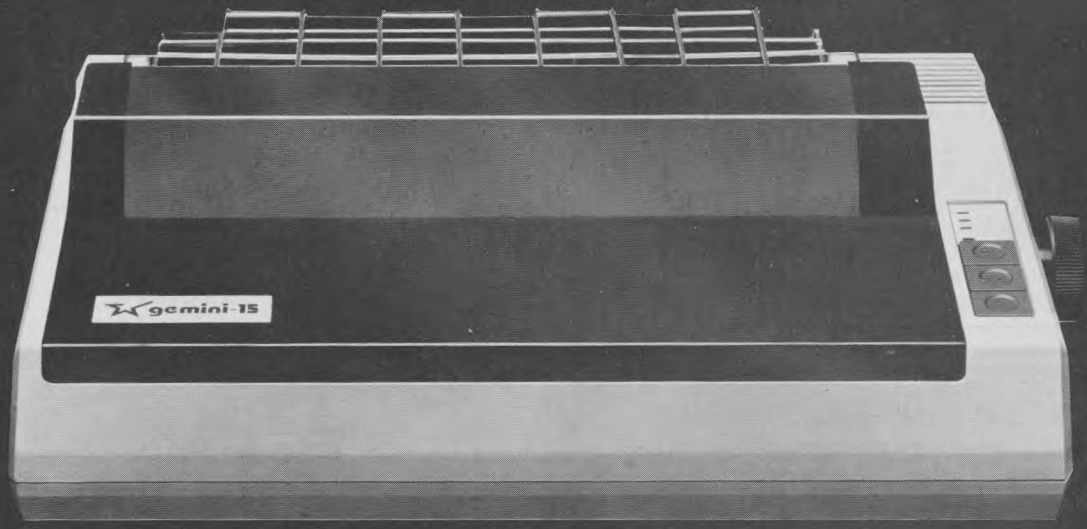

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Listing continued.

```
00970 IF LEFT$(Z$,1) = "+"  THEN Q = 3
00980 IF LEFT$(Z$,1) = "-"  THEN Q = 1
00990 X$ = MID$(Z$,2,1)
00997         REM
00998         REM  *****  Determine which face
00999         REM
01000 IF X$ = X$(0) THEN 1200
01010 IF X$ = X$(1) THEN 1400
01020 IF X$ = X$(2) THEN 1600
01030 IF X$ = X$(3) THEN 1800
01040 IF X$ = X$(4) THEN 2000
01050 IF X$ = X$(5) THEN 2200
01060 IF X$ = "H" THEN 2600
01070 IF X$ = "V" THEN 2700
01080 IF X$ = "S" THEN 2800
01090 IF X$ = "X" THEN 3000
01100 IF X0 = 1 THEN 3060
01110 RETURN
01197         REM
01198         REM  *****  FRONT face
01199         REM
01200 N0 = 0 : N1 = 2 : N3 = 5 : N5 = 5 : N7 = 1
01210 IF Q <> 3 THEN 1260
01220 N2 = 1 : N4 = 4 : N6 = 7 : N8 = 3
01230 GOSUB 2900
01240 GOSUB 2500
01250 GOTO 1310
01260 N2 = 4 : N4 = 1 : N6 = 3 : N8 = 7
01270 FOR J = 1 TO Q
01280     GOSUB 2400
01290     GOSUB 2500
01300 NEXT J
01310 M0 = M0 + 1
01320 GOTO 1100
01397         REM
01398         REM  *****  RIGHT face
01399         REM
01400 N0 = 1 : N1 = 2 : N3 = 5 : N5 = 3 : N7 = 3
01410 IF Q <> 3 THEN 1460
01420 N2 = 3 : N4 = 0 : N6 = 7 : N8 = 3
01430 GOSUB 2900
01440 GOSUB 2500
01450 GOTO 1510
01460 N2 = 0 : N4 = 3 : N6 = 3 : N8 = 7
01470 FOR J = 1 TO Q
01480     GOSUB 2400
01490     GOSUB 2500
01500 NEXT J
01510 M0 = M0 + 1
01520 GOTO 1100
01597         REM
01598         REM  *****  UP face
01599         REM
01600 N0 = 2 : N1 = 3 : N3 = 0 : N5 = 1 : N6 = 1 : N7 = 1 : N8 = 1
01610 IF Q <> 3 THEN 1660
01620 N2 = 1 : N4 = 4
01630 GOSUB 2900
01640 GOSUB 2500
01650 GOTO 1710
01660 N2 = 4 : N4 = 1
01670 FOR J = 1 TO Q
01680     GOSUB 2400
01690     GOSUB 2500
01700 NEXT J
01710 M0 = M0 + 1
01720 GOTO 1100
01797         REM
01798         REM  *****  BACK face
01799         REM
01800 N0 = 3 : N1 = 2 : N3 = 5 : N5 = 1 : N7 = 5
01810 IF Q <> 3 THEN 1860
01820 N2 = 4 : N4 = 1 : N6 = 7 : N8 = 3
01830 GOSUB 2900
01840 GOSUB 2500
01850 GOTO 1910
01860 N2 = 1 : N4 = 4 : N6 = 3 : N8 = 7
01870 FOR J = 1 TO Q
01880     GOSUB 2400
01890     GOSUB 2500
01900 NEXT J
01910 M0 = M0 + 1
01920 GOTO 1100
01997         REM
01998         REM  *****  LEFT face
01999         REM
02000 N0 = 4 : N1 = 2 : N3 = 5 : N5 = 7 : N7 = 7
02010 IF Q <> 3 THEN 2060
02020 N2 = 0 : N4 = 3 : N6 = 7 : N8 = 3
02030 GOSUB 2900
02040 GOSUB 2500
02050 GOTO 2110
02060 N2 = 3 : N4 = 0 : N6 = 3 : N8 = 7
02070 FOR J = 1 TO Q
02080     GOSUB 2400
02090     GOSUB 2500
02100 NEXT J
02110 M0 = M0 + 1
02120 GOTO 1100
02197         REM
02198         REM  *****  DOWN face
02199         REM
02200 N0 = 5 : N1 = 0 : N3 = 3 : N5 = 5 : N6 = 5 : N7 = 5 : N8 = 5
02210 IF Q <> 3 THEN 2260
02220 N2 = 1 : N4 = 4
02230 GOSUB 2900
02240 GOSUB 2500
02250 GOTO 2310
02260 N2 = 4 : N4 = 1
02270 FOR J = 1 TO Q
02280     GOSUB 2400
02290     GOSUB 2500
02300 NEXT J
02310 M0 = M0 + 1
02320 GOTO 1100
02397         REM
02398         REM  *****  Rotate any face clockwise
02399         REM
02400 X$ = K$(N0,8) : Y$ = K$(N0,7)
02410 K$(N0,8) = K$(N0,6) : K$(N0,7) = K$(N0,5) : K$(N0,6) = K$(N0,4)
02420 K$(N0,5) = K$(N0,3) : K$(N0,4) = K$(N0,2) : K$(N0,3) = K$(N0,1)
02430 K$(N0,2) = X$ : K$(N0,1) = Y$
02440 RETURN
02497         REM
02498         REM  *****  Rotate four edges of any face
02499         REM
```

More →

Listing continued.

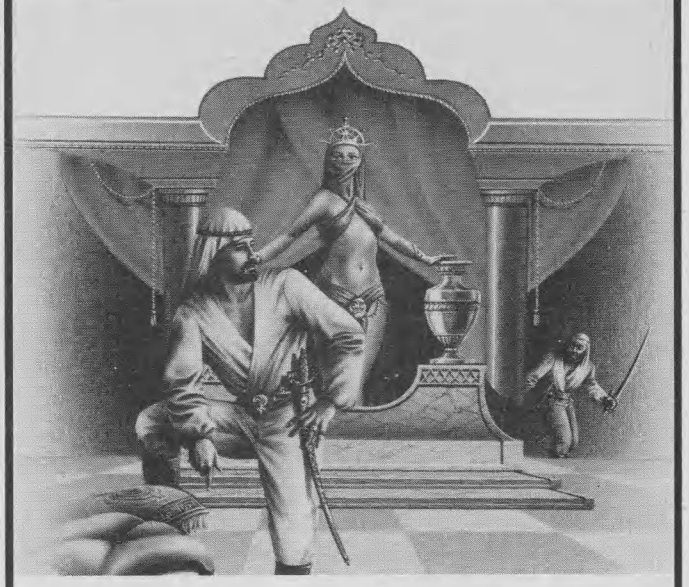
```
02500 FOR N = 0  TO 2
02510    N9 = N5 + N : IF N9 = 9 THEN N9 = 1
02520    M9 = N7 + N : IF M9 = 9 THEN M9 = 1
02530    L9 = N6 + N : IF L9 = 9 THEN L9 = 1
02540    X$ = K$(N1,N9) : K$(N1,N9) = K$(N2,L9) : K$(N2,L9) = K$(N3,M9)
02550    N9 = N8 + N : IF N9 = 9 THEN N9 = 1
02560    K$(N3,M9) = K$(N4,N9) : K$(N4,N9) = X$
02570 NEXT N
02580 RETURN
02597       REM
02598       REM  *****  Rotate mid-band front to right - +H
02599       REM
02600 FOR J = 1 TO Q
02610 X$ = K$(0,8) : Y$ = K$(0,4) : W$ = K$(0,0)
02620 K$(0,8)=K$(1,8):K$(0,4)=K$(1,4):K$(1,8)= K$(3,8):K$(1,4)= K$(3,4)
02630 K$(3,8) = K$(4,8): K$(3,4) = K$(4,4): K$(4,8) = X$ : K$(4,4) = Y$
02640 K$(0,0)= K$(1,0):K$(1,0)= K$(3,0):K$(3,0) = K$(4,0):K$(4,0) = W$
02650 X$(0) = LEFT$(K$(0,0),1) : X$(1) = LEFT$(K$(1,0),1)
02660 X$(3) = LEFT$(K$(3,0),1) : X$(4) = LEFT$(K$(4,0),1)
02670 NEXT J
02680 M0 = M0 + 1
02690 GOTO 1100
02697       REM
02698       REM  *****  Rotate mid-band front to up - +V
02699       REM
02700 FOR J1 = 1 TO Q
02710 X$ = K$(0,2) : Y$ = K$(0,6) : W$ = K$(0,0)
02720 K$(0,2)=K$(5,2):K$(0,6)=K$(5,6):K$(5,2)= K$(3,6):K$(5,6)= K$(3,2)
02730 K$(3,2) = K$(2,6): K$(3,6) = K$(2,2): K$(2,2) = X$ : K$(2,6) = Y$
02740 K$(0,0)= K$(5,0): K$(5,0)= K$(3,0): K$(3,0)= K$(2,0): K$(2,0)= W$
02750 X$(0) = LEFT$(K$(0,0),1) : X$(5) = LEFT$(K$(5,0),1)
02760 X$(3) = LEFT$(K$(3,0),1) : X$(2) = LEFT$(K$(2,0),1)
02770 NEXT J1
02780 M0 = M0 + 1
02790 GOTO 1100
02797       REM
02798       REM  *****  Rotate mid-band left to up - +S
02799       REM
02800 FOR J1 = 1 TO Q
02810 X$ = K$(2,4) : Y$ = K$(2,8) : W$ = K$(2,0)
02820 K$(2,4)=K$(4,2):K$(2,8)=K$(4,6):K$(4,2)= K$(5,8):K$(4,6)= K$(5,4)
02830 K$(5,8) = K$(1,6): K$(5,4) = K$(1,2): K$(1,6) = X$ : K$(1,2) = Y$
02840 K$(2,0)= K$(4,0): K$(4,0)= K$(5,0): K$(5,0)= K$(1,0): K$(1,0)= W$
02850 X$(2) = LEFT$(K$(2,0),1) : X$(4) = LEFT$(K$(4,0),1)
02860 X$(5) = LEFT$(K$(5,0),1) : X$(1) = LEFT$(K$(1,0),1)
02870 NEXT J1
02880 M0 = M0 + 1
02890 GOTO 1100
02897       REM
02898       REM  *****  Rotate any face counter-clockwise
02899       REM
02900 X$ = K$(N0,8) : Y$ = K$(N0,7)
02910 K$(N0,8) = K$(N0,2) : K$(N0,2) = K$(N0,4) : K$(N0,4) = K$(N0,6)
02920 K$(N0,7) = K$(N0,1) : K$(N0,1) = K$(N0,3) : K$(N0,3) = K$(N0,5)
02930 K$(N0,6) = X$ : K$(N0,5) = Y$
02940 RETURN
02997       REM
02998       REM  *****  Special 'X' code sequence
02999       REM
03000 X0 = 1
03010 S = VAL(MID$(Z$,3,2))
03020 IF S>S0 THEN 3210
03030 S$ = S$(S)
03040 X1 = 3110
03050 IF LEFT$(Z$,1) = "-" THEN X1 = 3150
03060 IF LEN(S$) = 0 THEN 3210
03070 FOR J2 = 0 TO 5
03080    X$(J2) = LEFT$(K$(J2,0),1)
03090 NEXT J2
03100 GOTO LN0(X1)
03110 Z1$ = LEFT$(S$,3)
03120 S$ = RIGHT$(S$,LEN(S$)-3)
03130 Z$ = LEFT$(Z1$,1) + X$(VAL(MID$(Z1$,2,1))) + RIGHT$(Z1$,1)
03140 GOTO 800
03150 Z1$ = RIGHT$(S$,3)
03160 S$ = LEFT$(S$,LEN(S$)-3)
03170 IF LEFT$(Z1$,1) = "+" THEN Z$ = "-"
03180 IF LEFT$(Z1$,1) = "-" THEN Z$ = "+"
03190 Z$ = Z$ + X$(VAL(MID$(Z1$,2,1))) + RIGHT$(Z1$,1)
03200 GOTO 800
03210 X0 = 0 : Z$ = " "
03220 RETURN
03297       REM
03298       REM  *****       AUTOSAVE
03299       REM
03300 DIM H(3),H$(3),H1$(6),H1(6),H2(6),H2$(4),H3(4),H3$(3),H5$(3)
03310 DIM H4$(3,3),H4(3,3),A(3,3,3)
03317       REM
03318       REM  *****  Restore cube to it's original configuration
03319       REM
03320 N0 = 0
03330 IF LEFT$(K$(0,0),1) = J$(0) THEN 3480
03340 H(0) = 1 : H(1) = 3 : H(2) = 4
03350 FOR H = 0 TO 2
03360    IF LEFT$(K$(H(H),0),1) <> J$(0) THEN 3420
03370    Z$ = "+X01"
03380    FOR H1 = 0 TO H
03390       GOSUB 800
03400    NEXT H1
03410    GOTO 3470
03420 NEXT H
03430 IF LEFT$(K$(2,0),1) <> J$(0) THEN 3460
03440 Z$ = "-X02" : GOSUB 800
03450 GOTO 3470
03460 Z$ = "+X02" : GOSUB 800
03470 H0 = 1
03480 IF LEFT$(K$(1,0),1) = J$(1) THEN 3580
03490 H(0) = 2 : H(1) = 4 : H(2) = 5
03500 FOR H = 0 TO 2
03510    IF LEFT$(K$(H(H),0),1) <> J$(1) THEN 3570
03520    Z$ = "+X03"
03530    FOR H1 = 0 TO H
03540       GOSUB 800
03550    NEXT H1
03560    GOTO 3590
03570 NEXT H
03580 IF H0 = 0 THEN 3600
03590 GOSUB 500
03597       REM
03598       REM  *****  Position UP edgies - U2, U4, U6, U8
03599       REM
03600 H(0) = 4 : H(1) = 2 : H(2) = 8 : H(3) = 6
```

(continued on page 138)

NOW AVAILABLE FOR THE APPLE II

Ali Baba
and the forty thieves

By Stuart Smith



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Us Festival

Nearly 200,000 people gathered for three days in a dusty, sweltering valley in San Bernardino, CA, to see 19 rock acts and eight circus tents filled with the latest developments in computer technology. The Us Festival was the brainchild of Apple inventor Steve Wozniak, who made sure the event was working. "I've been walking around myself, talking to thousands of people," he said. "I even tested the 'porta-john' to make sure there were no lines." (Kelly Canale photo.)

What do rock concerts and microcomputer exhibits have in common?

They both were featured at the recent Us Festival (Sept. 3–5 in San Bernadino, CA). The event was spearheaded by Apple king Stephen Wozniak, who attempted to promote the marriage of rock music and computer technology.

The Us Festival had several strikes against it from the start. Skeptics doubted that Wozniak could pull off an event of such magnitude, and even if he did, there was a chance that he'd take a financial loss.

But even with a relentless sun scorching the festival site at 100-plus degrees, and even with enough dust swirling about to choke 200,000 people twice, and even with a large group of angry journalists (irate over the poorly-planned press privilege policy), the Us Festival came off smoothly.

Make no mistake—the concerts took center stage at the festival, but computer technology was well represented.

Few of the nearly 200,000 Us Festival patrons on each of three days came to see computers. But most of them *did* wander through at least a few of the tents—whether it was out of a need for relief from the heat or out of sheer curiosity—to find mostly games and graphics.

Simplicity and fun were the overriding themes of the Technology Fair. In one of the eight circus tents devoted to computer-related displays, a row of real live 25-cents-a-shot video games passed for technology—and made a lot of money at the same time.

Still, most exhibitors managed to present worthwhile introductions to computers.

Lucia Grossberger and Harry Vertelney, authors of Designer's Tool Kit software for the Apple II and founders of Eclectic Electric, set up a gallery-type booth showing off the fusion of artwork and computers.

A 15-foot robot was used in Battlefield Earth *display. (Larry Canale photo.)*

Eclectic Electric's computer art is accomplished on a kind of electronic easel that's used to reproduce photos or drawings or to create new images on a computer.

The work displayed at the Technology Fair came from several artists, including Grossberger and Vertelney, as well as from physicist Bob Bishop (author of *Creative Tools* and one of the first research and development engineers at Apple), Ron Pellegrino (author of *The Electronic Arts of Sound and Light* and president of Electronics Arts Productions) and Scott Kimm (author of *Inversions: A Catalog of Calligraphic Cartwheels).*

Grossberger said she helped launch Eclectic Electric two years ago.

"We wanted to see what we could do with personal computers," the artist said. "I believed that you could have art on a floppy disk."

Grossberger's own artwork includes recreations of rock stars and album cover art. Some of her efforts were displayed on a 20-foot video screen that hung high above the Us Festival amphitheater stage.

Making imagistic music is the name of the game for Author Services, Inc. (ASI). The Hollywood-based corporation specializes in advancing the concept of movie soundtracks into book soundtracks.

Battlefield Earth, an epic by L. Ron Hubbard, is the first book to be put to music. Hubbard himself composed the

Steven Wozniak, right, shown with concert promoter Bill Graham, put $12.5 million into the Us Festival; he started Apple with $300. (Larry Canale photo.)

Eclectic Electric's computer art included this reproduction of rock group Santana's latest album cover. (Larry Canale photo.)

music, which is flavored with natural sounds and rhythms that come from a computer.

His book, set in the year 3000, involves a man who organizes a few surviving humans to overthrow an alien race that had taken over Earth 1000 years earlier. The accompanying music, classified as "computer space jazz," involves the use of a Fairlight to record, store and play on a keyboard any type of natural sound.

A Fairlight, explained Vaughn Young, who works with ASI public affairs, is a "computer designed to be a musical instrument." The Fairlight, on display at the Us Festival, allows musicians to play in sequence—or to blend the sounds.

"We're trying to enhance both the book industry and the music industry," Young said at the Technology Fair, "because both have felt threatened by computers. What we're doing is making a record of this book; we're making a musical score as if it was a movie.

"We're trying to show that the technologies are *not* different," he added. "It's a new concept for music. And the computer industry needs this market."

Several other music-related products were displayed at the Us Festival.

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Synthesis Module added human voices to games. (Larry Canale photos.)

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"With new technology, there's so many possibilities of things we can do," jazz keyboardist Herbie Hancock told fans crammed into the Technology Fair's main theater tent. Hancock gave an impromptu performance using the Alpha Syntauri after he spoke to the audience.

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Soundchaser Computer Music Systems features Apple II-compatible hardware as well as software that actually writes down music notes as you play and edits music you've already written.

Other features at the Technology Fair included displays of the Apple III Personal Computer System, the 212 Apple-Cat II modem, the Dow Jones News & Quotes Reporter and Dow Jones Portfolio Evaluator (both Apple II-compatible) and Artsci's Magic Window (also Apple-compatible).

The VIC-20 Personal Computer was displayed, along with the Victor 9000 Business Computer Manager Series, the Osborne I, the Infone portable computer terminal and the System One computer graphics program.

Dozens of other companies showed their wares, and even though they took a back seat to the sound of music, the Festival proved that rock music and technology can indeed co-exist. ■

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Apple DOS Revealed

This article reveals little-known capabilities of the Apple DOS (both 3.3 and 3.2) and helps you achieve assembly language efficiency while working with disk files.

By Donald J. Black

One large but little-known section of Apple DOS provides general-purpose file handling capabilities for assembly-language programs. This well-kept secret is exactly what the assembly-language programmer needs to write disk and file handling programs properly.

When using DOS from a Basic program, users request DOS services with print statements. Each print line that begins with a control-D is interpreted by DOS as a request for service. But what can you do if you want to request those services from an assembly-language program?

Assembly-language programs can simulate print statements—all they have to do is output a sequence of characters through the output hook (address in locations $36 and $37, or call $FDED). Files can be opened, read and written, and so on.

Characters can be transferred to and from files by calling input and output hooks. Programs can also use BLOAD and BSAVE commands to copy areas of memory to and from files. However, there are some limitations when you use print statements to call DOS. For example, you can only issue new requests when it appears to DOS that you are at the beginning of a line.

If your program is a general-purpose text manipulation program, you may not be able to guarantee being at the beginning of a line when you want to issue a new command. For example, in a text editor, you might want to switch from input to output in the middle of a line, or the text might not even have "lines." It would be nice to have another way to request DOS services.

Some programs use the RWTS routines for file manipulations. RWTS provides a way to read or write specific sectors on a disk. But this approach has some drawbacks. First, the program has to have a fairly complete knowledge of the structure of disk files. The present structure is well documented in the Apple DOS manual, but Apple might someday change or extend the format. Also, the program using RWTS to manipulate files must duplicate code that is already in DOS, which takes extra memory. Why use your time debugging code that is already available?

Code (hex)	Name	Meaning
0	No Operation	This is accepted by DOS but doesn't do anything
1	Open	Open a file
2	Close	Close a file
3	Read	Several functions for reading a file
4	Write	Several functions for writing a file
5	Delete	Delete a file
6	Catalog	Execute a Catalog command
7	Lock	Lock a file
8	Unlock	Unlock a file
9	Rename	Rename a file
$A	Position	Indicate position in file for next Read or Write
$B	Init	Initialize a disk
$C	Verify	Verify the integrity of a file

Table 1. Valid operations in Apple DOS.

A Better Way

DOS provides a set of general-purpose file handling operations, which are designed for assembly-language programs. A standard entry point is set up by DOS in low memory (at location $3D6); calling the entry point requests a DOS operation.

There is a standard parameter area for these DOS calls. Location $3DC is the entry point of a subroutine that returns the address of the parameter area. This subroutine puts the address in the Y and A registers (Y = low byte, A = high byte). The parameter area indicates which operation is requested. It also must contain the specific parameters for that operation. The format depends on the specific operation requested.

To perform a specific operation, a program can:

1. Call $3DC to get the address of the parameter area (JSR $3DC)
2. Save that address
3. Set up the parameter area
4. Call $3D6 (JSR $3D6)

The results depend on the specific operation and parameters. In general, when DOS returns to your pro-

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gram, the carry flag is an error indicator—carry clear means the requested operation was completed successfully, and carry set means an error was detected. If an error is indicated, DOS has stored an error code in the parameter area.

The first byte of the parameter area always contains the operation you want to perform. This must be a number between 0 and $C. Any other number is an illegal request and will be rejected by DOS. DOS will go no further, but will store error code 3 in the parameter area, set the carry flag and return.

Valid operations are shown in Table 1. The Read and Write operations actually have several choices. The second byte of the parameter area indicates which sub-operation is requested.

Read operations are given in Table 2. Write operations, shown in Table 3, are similar. For Read and Write operations, the file must have been opened with an open operation.

Most operations perform some action with a file. For each file you are manipulating, you must reserve an area of memory. DOS uses this area to remember various items of information about the file. For example, DOS keeps the current position in the file in this area; the DOS manual calls this area a file buffer.

When you enter a Maxfiles command, you tell DOS how many file buffers to reserve for its own use. DOS uses those file buffers when handling commands or print statements. You are not restricted to using those file buffers in your assembly-language program. For each operation, you specify the address of the file buffer to use. This is part of the parameter area.

A file buffer actually consists of a number of sections. Section 1, the File Data Block (FDB), contains general information about the file such as record length, current position, and so on. Section 2 contains the current Track and Sector List (TSL) sector. Section 3 contains the current data sector for the file.

Section 1 must be 45 bytes long (hex $2D). Sections 2 and 3 must each be 256 bytes long (hex $100). These do not have to be in the same area of memory. You will also need a 30-byte area for file names. You may also need a buffer area for reading and writing records.

Parameter Area Format

The format of the parameter area for each specific operation is described in Tables 4 through 16. Many of the parameters are two-byte values (record length, buffer address, etc.). In all such cases, the lower byte of the value comes first, in the lower byte of the parameter. In the following descriptions the first byte of the parameter area is called byte number zero (0). Byte number one (1) is the second byte, and so on.

Operation 0—NO-OP

Byte #	Purpose
0	Code for No-Op

Table 4. Operation 0—No-op.

Code	Name	Meaning
0	No-Op	Accepted but doesn't do anything
1	Read Character	Returns the next character from the file
2	Read Record	Returns a group of characters from the file (count and memory address specified in the parameter area)
3	Set Position, Read Character	Indicates position in the file, then returns the next character from the file at that position
4	Set Position, Read Record	Indicates position in the file, then returns a group of characters from the file (count and memory address specified in the parameter area)

Table 2. Read operations in Apple DOS.

Code	Name	Meaning
0	No-Op	Accepted but doesn't do anything
1	Write Character	Writes the next character to the file
2	Write Record	Writes a group of characters to the file (count and memory address specified in the parameter area)
3	Set Position, Write Character	Indicates position in the file, then writes the next character to the file at that position
4	Set Position, Write Record	Indicates position in the file, then writes a group of characters to the file at that position (count and memory address specified in the parameter area)

Table 3. Write operations in Apple DOS.

Operation 1—OPEN FILE

Byte #	Purpose
0	Code for Open File = 1
1	Not used
2 & 3	Record length. 0 means use default, currently = 1
4	Volume number of volume containing file to open; 0 means any volume number is accepted; non-zero means volume number from disk must match this number; DOS returns the actual volume number in this byte
5	Drive number of file; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7	File type byte; if file is created, this will be the file type (see DOS manual description of directory entries for description of this byte); DOS returns the file type of the file in this byte
8 & 9	Address of 30-byte buffer containing file name; all 30 bytes must match; file names are normally padded to 30 characters by appending spaces
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 5. Operation 1—Open file.

Bytes $C through $11 in Operation 1—Open File (Table 5) describe the file buffer to use for this file. The same addresses must be used for any other operations performed on the same file. DOS uses these areas. Your program should not change their contents.

For the Open operation, starting with DOS 3.2, you have a choice of what to do if you try to open a nonexistent file. This choice is specified by the X register when the request is issued.

If the X register is 0 and the file does not exist, DOS will create the file and then open it. If the X register is not 0 and the file does not exist, DOS will not create the file. Instead it will return error code 6 (file not found).

The Open operation searches the directory for the file. If the file is found or created, the "current" position is set to the beginning of the file. The first TSL sector is read into section 2 of the file buffer. If the file is successfully opened, you may continue with other operations on the file.

The Close operation (Table 6) writes out the current data sector if it has never been written (new data) or has been changed. Close also writes out the current TSL if it needs to be written. Any unwritten sectors that were allocated for the file but not used are made available for other files. After a Close you may use the file buffer for other files or for other purposes.

For all Read functions, outlined in Table 7, each character is read from the "current" position in the file. Then the current position is updated to the next character. Functions 3 and 4 set a new position in the file, then begin reading at the new position. The position is specified as a record number.

The record number is multiplied by the record length you specified when you opened the file. Then the byte number in the record (bytes 4 and 5 in the parameter area) is added to the result. This gives the byte position in the file for the next character to read. The first record of the file is record 0. The first byte of each record is byte number 0.

For functions 2 or 4, an initial count of 0 characters (bytes 6 and 7) reads no characters. After each character is read, the address is incremented and the count is decremented.

A portion of the record may have been read when an error occurs. You can always determine how many characters were read by subtracting the starting address from the ending address (DOS changes bytes 8 and 9, so they will contain the ending address). You should make sure your program remembers the starting address.

DOS takes care of reading the appropriate sectors for the file. It follows the Track and Sector List. It also keeps track of which sectors are in the file buffer. Your program need only keep track of the relative position of data in the file. DOS determines which sectors on the disk are needed.

DOS only reads a sector from disk when the required sector is not in the file buffer, which happens when the position in the file moves from one sector to another. This automatic buffering technique may save many

Byte #	Purpose
0	Code for Close File = 2
1-3	Not used
4	Returns actual volume number
5-9	Not used
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 6. Operation 2—Close file.

Byte #	Purpose
0	Code for Read = 3
1	Code for Read sub-function: 0 = No-Op, 1 = Read Character, 2 = Read Record, 3 = Set Position, Read Character, 4 = Set Position, Read Record
2 & 3	Record number for functions 3 or 4
4 & 5	Byte number in record for functions 3 or 4; bytes 2-5 indicate the new position for functions 3 or 4
6 & 7	Number of characters to read for functions 2 or 4; this does not have to be the same as the record length
8 & 9	Address of buffer to accept characters for functions 2 or 4; for functions 1 or 3, DOS returns the character read in byte 8, and byte 9 is not used
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 7. Operation 3—Read.

Byte #	Purpose
0	Code for Write = 4
1	Code for Write sub-function: 0 = No-Op, 1 = Write Character, 2 = Write Record, 3 = Set Position, Write Character, 4 = Set Position, Write Record
2 & 3	Record number for functions 3 or 4
4 & 5	Byte number in record for functions 3 or 4
6 & 7	Number of characters to write - 1 for functions 2 or 4; this does not have to be the same as the record length
8 & 9	Address of buffer containing characters to write for functions 2 or 4; for functions 1 or 3, byte 8 contains character to write, and byte 9 is not used
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 8. Operation 4—Write.

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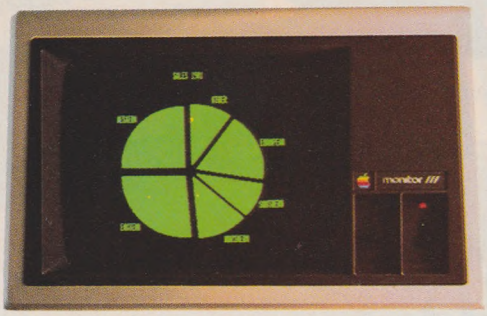

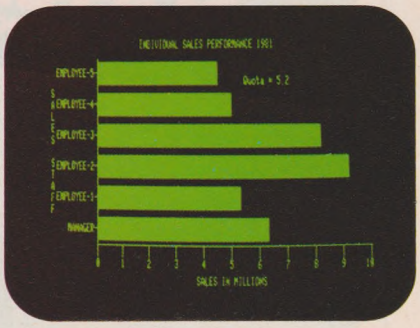

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Curve Fitting	5 Kinds	1	None
Data Points (Max.)	3500+	645	36
Plotter Compatible	Virtually Any	None	H-P7470A Only
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Math Functions	Yes	Yes	No
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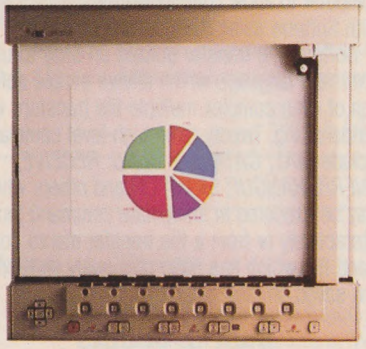

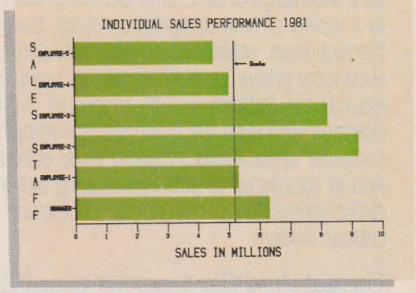

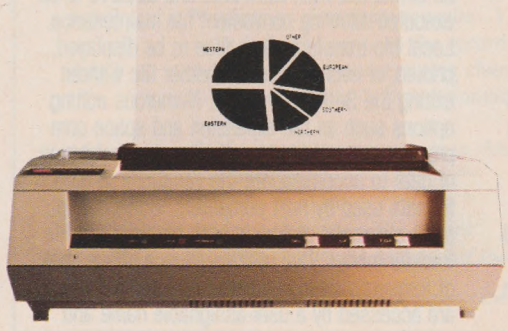

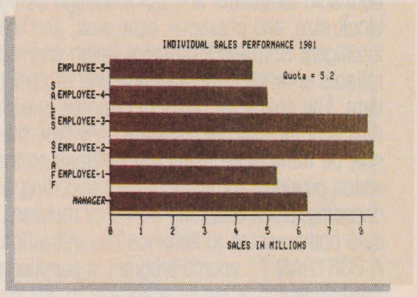

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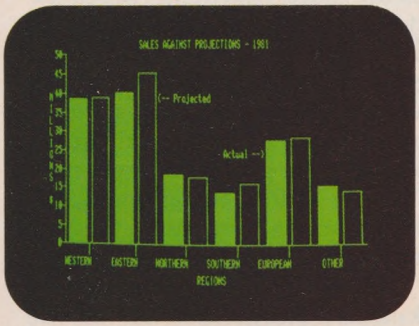

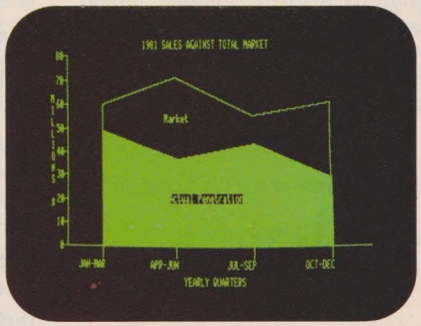

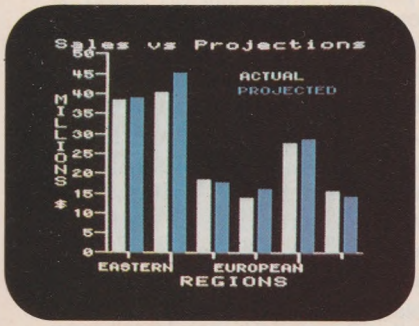

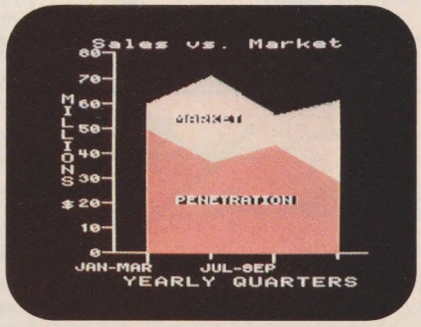

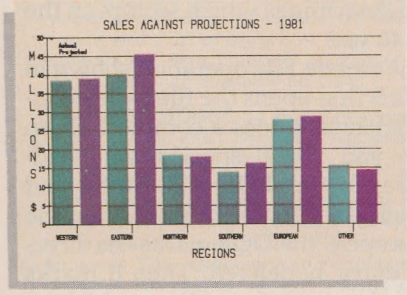

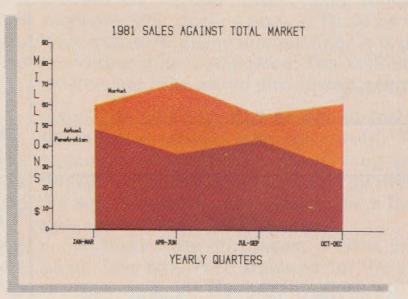

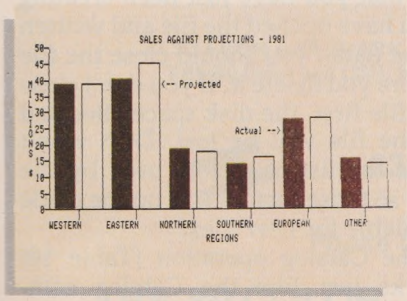

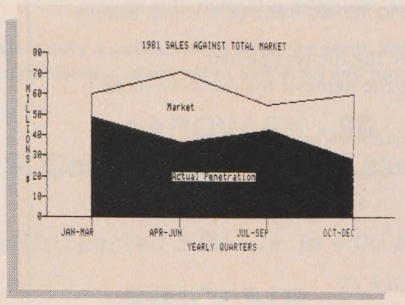

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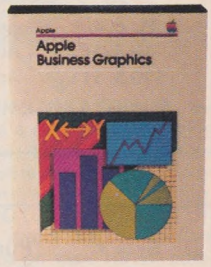

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disk accesses.

For all Write functions, shown in Table 8, each character is written at the "current" position in the file, then the current position is updated to the next character. Functions 3 and 4 set a new position in the file, then begin writing at the new position. The position is specified as a record number.

The record number is multiplied by the record length you specified when you opened the file. Then the byte number in the record (bytes 4 and 5 in the parameter area) is added to the result. This gives the byte position in the file for the next byte to write. The first record of the file is record 0. The first byte of each record is byte number 0.

For functions 2 or 4, an initial count of 0 characters (bytes 6 and 7) writes one character. After each character is written, the address is incremented and the count is decremented.

Note the anomaly: for Write functions 2 and 4, the count you specify is one less than the actual number of characters you write. This is different than the Read functions, which expect an exact character count.

A portion of the record may have been written when an error occurs. You can always determine how many characters were written by subtracting the starting address from the ending address (bytes 8 and 9).

As characters are written, they are stored in the current data sector buffer. The buffer will be written out to disk when the position in the file moves to a different sector. This will happen when the buffer is full or when you set a new position. This buffering technique may save many disk accesses.

However, you must remember to do a Close when you have finished writing a file. The Close will make sure all buffers are written out to disk. DOS takes care of writing the appropriate sectors for the file, and allocates additional sectors when necessary. It also keeps track of which sectors are in the file buffer. Your program need only manage the relative position of data in the file. DOS determines which sectors on the disk to use.

The Delete File operation shown in Table 9 first opens the file to be deleted. Because it does a complete Open File, you must specify valid addresses for the FDB, TSL buffer and current data sector buffer. After the file is open, the DOS marks the directory entry as deleted. Then it marks all of the disk space allocated to the file as available for new files.

Note that if you want to discard a file that you have just been creating (you have opened the file and written some data), you should close the file before you delete it. If you don't close the file first, the disk space allocated to the file will be lost. DOS won't have the list of sectors used by the file, so those sectors will not be made available for new files.

The Catalog operation (Table 10) works just like the Catalog command.

Byte #	Purpose
0	Code for Delete File = 5
1-3	Not used
4	Volume number of volume containing file to delete; 0 means current volume; non-zero means volume number from disk must match this number
5	Drive number on which file is located; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7	Not used
8 & 9	Address of 30 byte buffer containing the name of the file to delete; all 30 bytes must match
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 9. Operation 5—Delete file.

Byte #	Purpose
0	Code for Catalog = 6
1-3	Not used
4	Volume number
5	Drive number for which catalog is desired; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7-9	Not used
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 10. Operation 6—Catalog.

Byte #	Purpose
0	Code for Lock File = 7
1-3	Not used
4	Volume number of volume containing the file to lock; zero means use the current volume; non-zero means the volume number of the disk must match this number
5	Drive number on which the file is located; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7	DOS returns the file type from before the file was locked
8 & 9	Address of 30-byte buffer containing the name of the file to be locked; all 30 bytes must match
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 11. Operation 7—Lock file.

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Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

CIRCLE WORLD by Bob Anderson — The Alien culture has built a huge world in the shape of a ring circling their sun. They left behind some strange creatures and a lot of advanced technology. Unfortunately, the world is headed for destruction and it is your job to save it before it plunges into the sun!

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HAUNTED HOUSE by Bob Anderson — This one is for the kids. The house has ghosts, goblins, vampires and treasures — and problems designed for the 8 to 13 year old. This is a real adventure and does require some thinking and problem solving — but only for kids.

Authors note to players—This one was fun to write. The vocabulary and characters were designed for younger players and lots of things happen when they give the computer commands. This one teaches logical thought, mapping skills, and creativity while keeping their interest.

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Authors note to players — This one feels good. Not only is it designed for the younger set (see note on Haunted House), but it also plays nicely. Instead of killing, you have to save lives to win this one. The player must help others first if he/she is to survive — I like that.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

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The Lock File operation (Table 11) first opens the file to be locked. Because it does a complete Open File, you must specify valid addresses for the FDB, TSL buffer and current data sector buffer. After the file is open, the file is marked as locked. The file type byte as it was before the file was locked is returned in byte 7 of the parameter area.

The Unlock File operation (Table 12) first opens the file to be unlocked. Because it does a complete open file, you must specify valid addresses for the FDB, TSL buffer and current data sector buffer. After the file is open, the file is marked as unlocked. The file type byte as it was before the file was unlocked is returned in byte 7 of the parameter area.

Byte #	Purpose
0	Code for Unlock File = 8
1-3	Not used
4	Volume number of volume containing the file to unlock; 0 means use the current volume; non-zero means the volume number of the disk must match this number
5	Drive number on which the file is located; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7	DOS returns the file type as it was before the file was unlocked
8 & 9	Address of 30-byte buffer containing the name of the file to be unlocked; all 30 bytes must match
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 12. Operation 8—Unlock file.

Byte #	Purpose
0	Code for Rename File = 9
1	Not used
2 & 3	Address of 30-byte buffer containing new file name
4	Volume number of volume containing the file to be renamed; 0 means use the current volume; non-zero means the volume number of the disk must match this number
5	Drive number on which the file is located; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7	DOS returns the file type byte in this byte
8 & 9	Address of 30-byte buffer containing the old file name; all 30 bytes must match
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 13. Operation 9—Rename file.

Byte #	Purpose
0	Code for Position File = $A
1	Not used
2 & 3	Record number
4 & 5	Byte number in record
6-9	Not used
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 14. Operation $A—Position file.

The Rename File operation (shown in Table 13) first opens the file, using the old file name (the address of the old file name is specified in bytes 8 and 9 of the parameter area). Because a complete Open File is done, you must specify valid addresses for the FDB, TSL buffer and current data sector buffer. After the file is open, the new name is written into the directory entry. There is no check that the new name already exists. You can end up with more than one file having the same name if the new name is the same as one that already exists.

The Position File operation in Table 14 sets the new position in the file for the next read or write request. The record number is multiplied by the record length you specified when you opened the file. Then the byte number in the record is added to the result. This gives the byte position in the file for the next character to read or write. The first record of the file is record 0. The first byte of each record is byte number 0. The file must be open before you can do a Position File operation.

The Initialize Disk operation (Table 15) first calls RWTS to format the disk (function = 4). It then writes a Volume Table of Contents (VTOC) and an empty directory on track $11 of the disk. Finally, it writes a copy of DOS on tracks 0, 1 and 2.

The name of the greeting program on the new disk will be the name of the last program run. You can change this name if you wish. DOS has a parameter buffer for file names for commands. The file name in this buffer when you initialize the disk is the name of the greeting program. You can store the desired name of your greeting program in this buffer.

You can find the address of this file name buffer in a table in the beginning of DOS. Location $3D2 (part of the JMP instruction at $3D0) and location $37 (output hook when DOS is connected) both contain the first page number of DOS.

For a 48K system, this will be page $9D, meaning DOS begins at location $9D00. This is not the same as HIMEM. HIMEM reserves space for file buffers. For a 48K system and MAXFILES = 3, HIMEM is set to $9600.

Once you have found the beginning of DOS, you can find the address of the file name buffer. Locations 6 and 7 in the table at the beginning of DOS contain the ad-

dress of the file name buffer. For a 48K system, the locations are $9D06 and $9D07. For DOS 3.2 and 3.3 the buffer is at $AA75.

Note that you need to store the page number of the beginning of DOS in byte 1 of the parameter area. This is the same page number you found in location $3D2 as described above.

The Verify File operation (Table 16) first opens the file to be verified. Because it does a complete Open File, you must specify valid addresses for the FDB, TSL buffer and current data sector buffer. The operation then reads the file until the end of the file is reached or an error occurs.

By now you will have noticed the pattern. Most operations open a file and perform some action on the file. For those operations, bytes 4, 5 and 6 are the Volume, Drive and Slot numbers. Bytes 8 and 9 are the address of the file name. Bytes $C through $11 describe the file buffer. DOS returns the actual volume number in byte 4 and the file type byte in byte 7.

Remember that when you open a file, you declare addresses that describe the file buffer. You must always use the same addresses for other operations for the same file.

Since DOS has no provision for default values for drive and slot numbers, you must specify them when needed. Do not specify 0. However, a reasonable default for your program would be to use the drive and slot from which the program was loaded. You can find these values in the DOS I/O Block, which is a parameter area for RWTS. Its format is described in the DOS Manual (chapter 9).

DOS has its own I/O Block, which it uses for commands like Run or BLoad. You can call the subroutine at location $3E3 to get the address of the DOS I/O Block (returned in the Y and A registers). Then you can look in the I/O Block for the drive and slot numbers.

Programmer's Tool

These operations provide the assembly-language programmer with all the tools required for general-purpose file handling programs. For example, to read a sequential file, you can use the following operations:

1. open the file
2. use successive Read Character calls until an End of Data error is reported
3. close the file

Byte #	Purpose
0	Code for Initialize Disk = $B
1	Memory page number of beginning of DOS code
2 & 3	Not used
4	New volume number for disk
5	Drive number of disk to be initialized; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7-9	Not used
$A	DOS returns the error code in this byte if error
$B-$11	Not used

Table 15. Operation $B—Initialize disk.

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Byte #	Purpose
0	Code for Verify File = $C
1-3	Not used
4	Volume number of volume containing the file to be verified; 0 means use the current volume; non-zero means the volume number of the disk must match this number
5	Drive number on which the file is located; this must be specified
6	Slot number in which the disk drive's controller is located; this must be specified
7	DOS returns the file type byte in this byte
8 & 9	Address of 30-byte buffer containing the name of the file to be verified; all 30 bytes must match
$A	DOS returns the error code in this byte if error
$B	Not used
$C & $D	Address of FDB
$E & $F	Address of current TSL buffer
$10 & $11	Address of current data sector buffer

Table 16. Operation $C—Verify file.

Byte #	Purpose
2, 3	Range error (Invalid request code)
4	Diskette is write protected
5	End of data
6	File not found
7	Volume number mismatch
8	I/O error
9	Diskette is full
$A	File is locked

Table 17. DOS error codes

Writing a sequential file is similar. Substitute Write Character for Read Character operations.

For random I/O, specify a record length when you open the file. Then you may declare at any time where to begin reading or writing next. The new position can be declared as a separate operation or as part of the desired Read or Write operation.

Using these operations lets DOS take care of allocating space, following the TSL list and managing the disk directory structure. You take advantage of the DOS buffering to cut down on the number of disk accesses. You don't have to duplicate DOS code in your program. In addition, you shouldn't have to change your program if DOS changes.

By designing these operations with a standard calling sequence, Apple has implicitly promised not to change their meanings. Thus, it doesn't matter if you are using DOS 3.2 or 3.3.

The operations perform general functions. If the way DOS implements the functions changes, the operations can still do the same thing. For example, when DOS 3.3 came out, disks changed from 13 to 16 sectors. Programs that used RWTS to read and write files probably had to be changed to allow for 16 instead of 13 sectors. But programs using the general-purpose functions let DOS take care of all of the changes. They wouldn't have to change at all.

These operations can be quite an aid for the assembly-language programmer. They can make life a lot easier, which is what tools like DOS are all about.■

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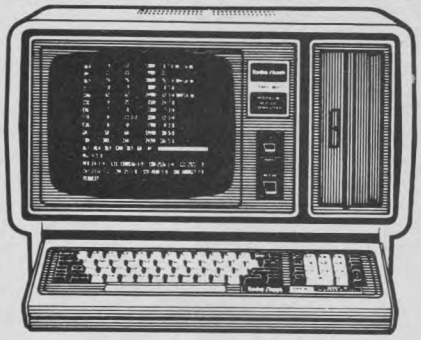

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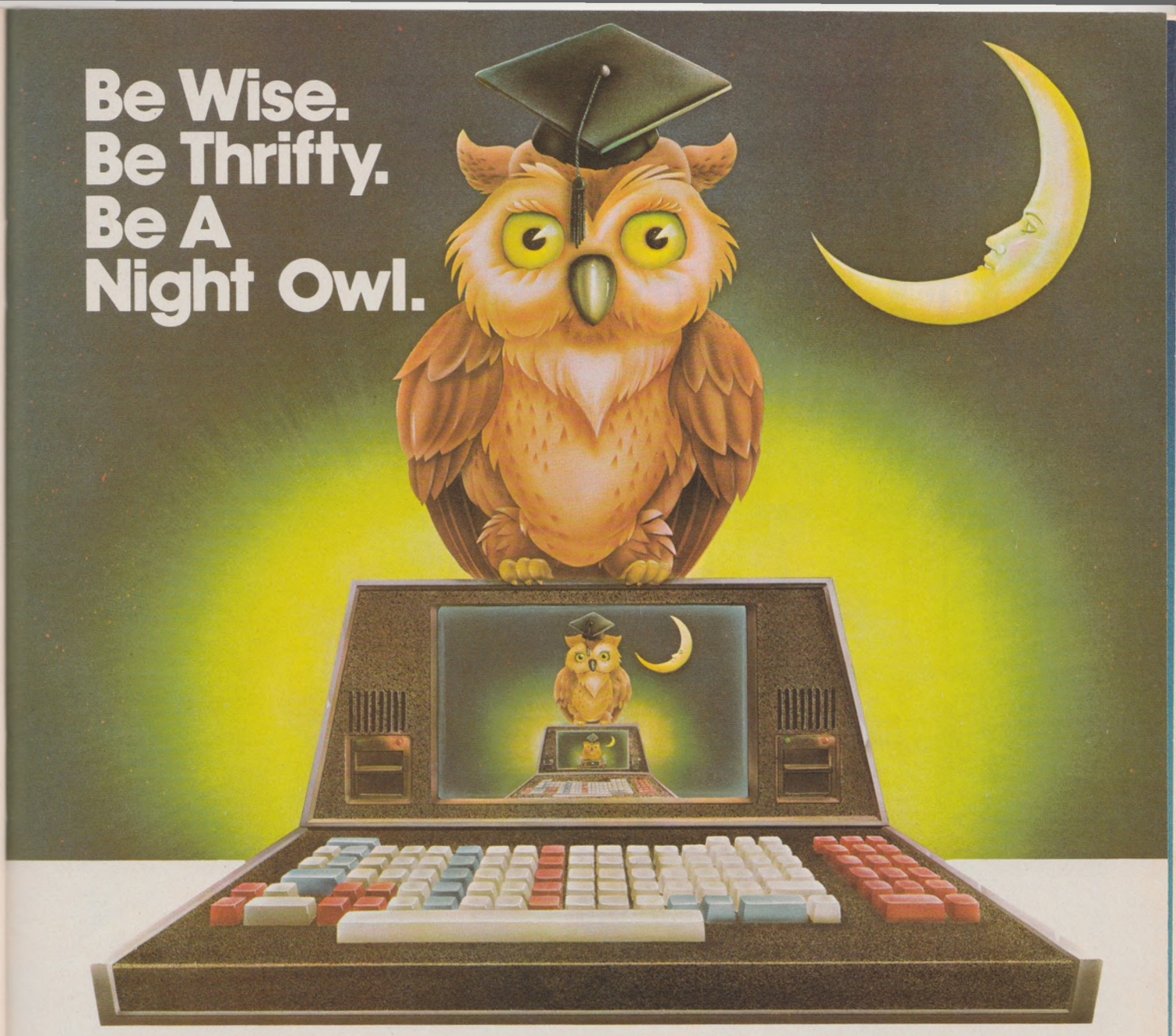

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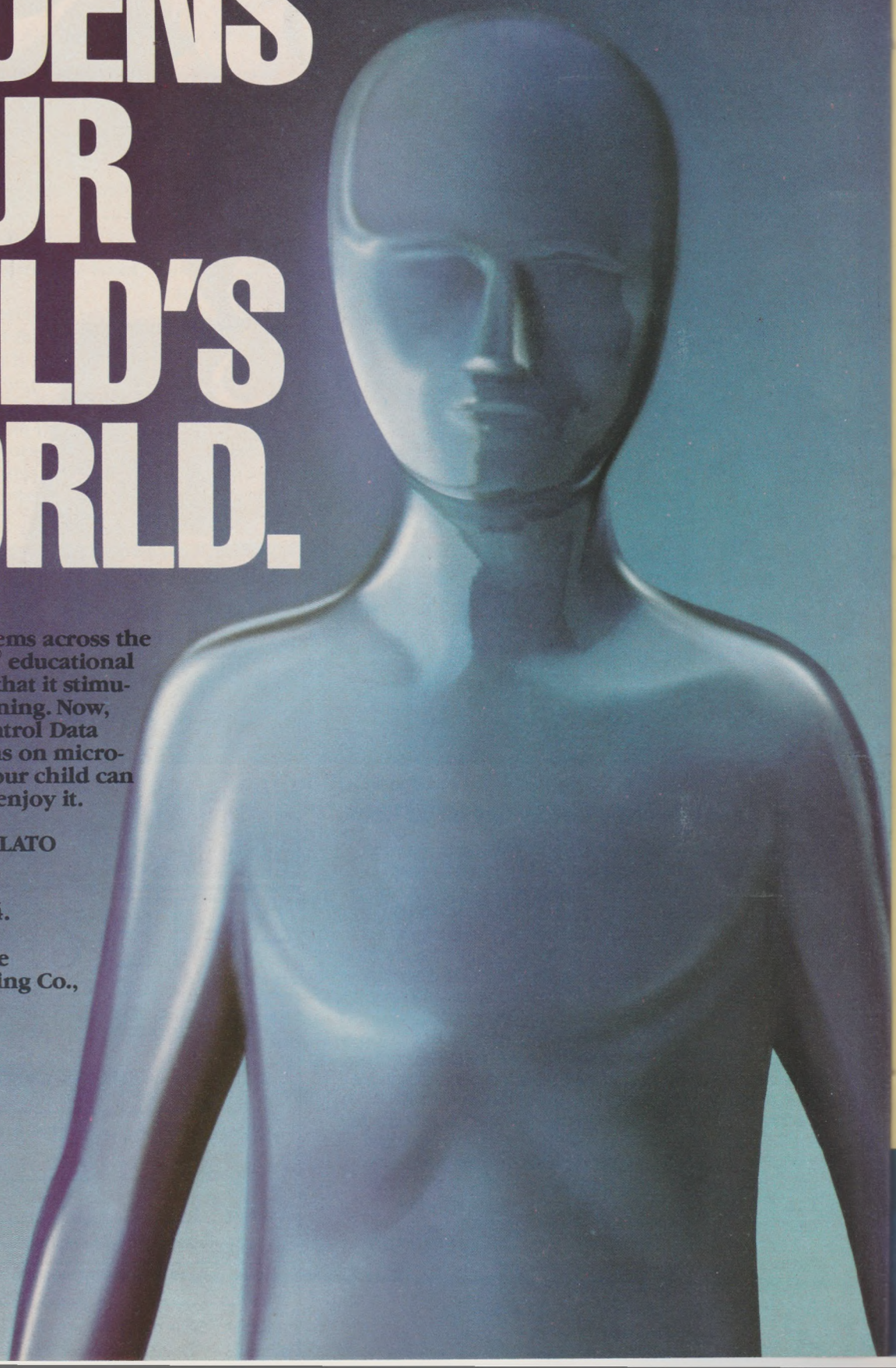

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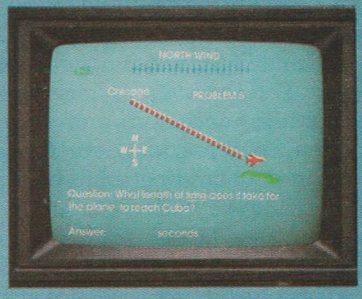

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By John Francis

One fascinating use for a personal computer is as a tool for communicating with other systems and with the people who use them. Few computer demonstrations are as impressive as one system calling another (perhaps at a scheduled time to get the lowest rate), transferring an error free data file and then hanging up to go about other business. The data transferred might be a personal message to the owner of the remote system, the latest version of a favorite software program or even a magazine article for editorial review.

Until recently, setting up a system to do all that would have been quite a job, requiring a great deal of specialized knowledge. Communications products which "simply plug into a telephone jack" have been available for some time, but adapting these products and their software to your particular system has not always been easy. For the average personal computer user who wants more than what a simple acoustic coupler will do, the product landscape has been pretty barren.

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One of the first products of this type to appear on the microcomputer scene was the Bizcomp Intelligent Modem (Business Computer Corp., PO Box 7498, Menlo Park, CA 94025). Fascinated by the potential of a microprocessor/modem combination, I ordered a copy of the user's manual for one of the Bizcomp models; after reading it I ordered a Model 1022 for my home system.

The Bizcomp performs modulation, demodulation, automatic (pulse or tone) dialing, recognition of dial tone and busy signals, automatic answering and more—all over two standard connections: one to the phone line (approved under the rules of the Federal Communications Commission) and the other to your computer. Programming is simple and can be done in any language that provides input and output access to a serial port.

Intelligent vs Dumb

The Bizcomp modems differ from most other direct-connect units—the telephone control logic has been moved into the modem package. With this design, writing a program to do sophisticated communications becomes much simpler, and need not involve assembly language or fancy timing techniques that might produce wrong numbers if the coding isn't exactly right for your machine.

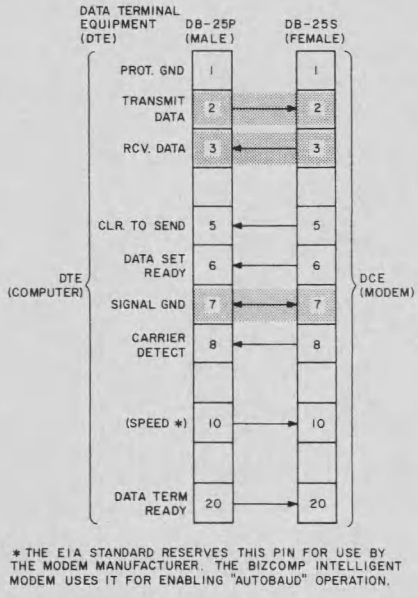

Fig. 1. Signal lines of the RS-232 interface. The highlighted lines are the only three required by the Bizcomp 1022.

The Serial Connection

Most personal computers have, or can easily be equipped with, an RS-232 serial port. This interface lets you add accessories such as printers and modems to your system. Serial transmission is compatible with the telephone system, and is thus the accepted method of sending data signals over long distances.

The Bizcomp design requires minimum signals from the computer (transmit data, received data and signal ground), while supplying safe default values for signals that your system may or may not require.

Fig. 1 shows the signal lines of the RS-232 interface, and highlights the three (the bare minimum) required for successful use of the Bizcomp. The EIA RS-232 signal definitions and their use with the Bizcomp follow:

Pin 1, Protective Ground—This is not a logic signal; it is reserved for a wire that serves the same purpose as the U-shaped third prong on a power cord (electrical safety). Since this line is optional and the Bizcomp is a low-voltage, fully insulated unit, this pin in the connector is unused.

Address correspondence to John Francis, PO Box 23154, San Jose, CA 95153.

Pin 2, Transmit Data—Your serial port provides the output data signal to the modem on this pin. The output data stream is used for messages to the remote computer and the intelligent modem (at different times; see code multiplexing, below).

Pin 3, Received Data—The modem provides its demodulated received signal to the serial port on this pin. Using code multiplexing, status messages from the microprocessor in the Bizcomp are also fed into your system over this line.

Pin 5, Clear to Send—The modem uses this line to indicate to the computer that it can send data on pin 2. Your serial port may or may not require this input from the modem; the Bizcomp provides a steady true signal (+8 V) on this line whenever it is turned on, just in case the computer requires it.

Pin 6, Data Set Ready—This line is also kept at a true level whenever the modem is on, and indicates to the computer that the modem is operating. Your serial port may or may not require this signal.

Pin 7, Signal Ground—This line provides a voltage reference for the other logic signals, so that voltages on the associated lines at both ends of the cable closely agree. It is not a logic signal, but serves to help define the logic signals on other lines.

Pin 8, Carrier Detect—The usual meaning of this signal is that the remote modem's carrier (the telephone-compatible signal which is modulated by data) has been detected (recognized) by the local modem. Its use is somewhat different with the Bizcomp; its code-multiplexed status messages might be ignored by the computer if the original definition were followed precisely. The Bizcomp holds this line true whenever it is turned on, so that both modem status and received data messages will be treated as valid by systems which use this signal.

Pin 10, Speed—The signal on this line is not defined in the RS-232 standard other than to say that it is reserved for special use by the modem manufacturer. It is used as an input to the Bizcomp when automatic speed selection is desired. Normally (and when this line is left unconnected) the Bizcomp expects code-multiplexed command messages on pin 2 at 300 bits per second (bps) and sends status messages on pin 3 at the same speed. If the user ties pin 10 to a true level (e.g., jumpers it to pin 6 inside the connector), the Bizcomp automatically determines the speed over the serial port by checking the first character it gets over the transmitted data line (this is sometimes called autobaud operation).

Pin 20, Data Terminal Ready—When this signal is used, your serial port indicates its readiness to communicate via a positive voltage on this pin; if left unconnected at the serial port, the ready condition is assumed. When automatic answering is enabled (see below), the serial port may temporarily change this signal to false (negative) to suspend automatic answering.

Compatibility

One problem you might have in connecting the Bizcomp (or any similar device) to your serial port is the "sex" of the connector at the RS-232 interface and the "sense" of the connector wiring (i.e., Data Terminal Equipment [DTE] or Data Communications Equipment [DCE]). The computer's end of the interface is properly terminated with a cable ending in a male Cinch-type DB-25P connector, and is wired for DTE operation; the modem is (by definition) DCE, and its connector is always female. However, in order to make it simpler to connect the computer to other DTE devices (such as teleprinters), the computer's connector (probably female, in this case) may have been wired as a DCE interface; if so, an adapter (see Fig. 2 for schematic) is required.

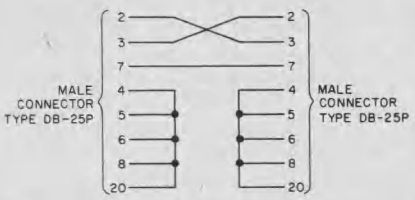

Fig. 2. Null Modem adapter for interfacing Bizcomp with a computer wired as a DCE device.

Not included in the EIA RS-232 standard is a method by which signalling information such as telephone numbers, progress of the call and the like can be exchanged between the computer and the telephone system. Traditional methods of handling this problem are much more involved and expensive than are appropriate to a personal microcomputer, and until the Bizcomp solution appeared, completely automatic telephone communication was not easily available for many personal systems.

Code Multiplexing

Bizcomp's solution to the signalling problem is clever and effective. They use the same data paths (i.e., the Transmit Data and Receive Data signals) for signalling that are used for ordinary data transmission, but at different times.

When first turned on, the Bizcomp is in command mode. In this mode, any data transmitted by your system on pin 2 is automatically directed to the microprocessor in the modem, where it is interpreted as a command (such as to dial a telephone number or to enable automatic answering).

Once a data connection is established, it transfers to data mode, where it simply passes transmit and receive data to and from the telephone line. Data mode continues until the telephone connection is ended, either by the party at the other end of the connection or by your program's sending of a special two-character escape sequence (ASCII code DLE followed by EOT).

In either case, the end of the data connection is indicated to your system by a special signal called a "long space" or "break" followed by a status message from the Bizcomp indicating disconnection. The long space signal (not to be confused with the ASCII character called space) is sometimes called break, and is sent using the serial port's write break function. It is received as one or more characters which lack a stop bit, a condition called a framing error.

Code multiplexing requires that your system and the intelligent modem agree on which mode is in effect at any given time; this will avoid sending false commands to the modem and having your program confuse status and data messages received over the serial port. Also, should it ever be necessary to transmit data that duplicates the escape sequence (as might occur in transmitting a CP/M COM file), an alternate procedure must be available so that it can be treated as data instead of forcing the modem into command mode and disconnecting the call.

Keeping track of which mode is in effect is relatively simple. When power is applied to the Bizcomp (probably coincident with booting up your computer), command mode can be assumed. If for some reason this is not convenient, transmitting the escape sequence or a long space signal

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of 1.6 seconds duration will force it into a reset condition. The Bizcomp always indicates the termination of a call with a break or a long space on the received data line (pin 3); in addition to indicating disconnection, this information may be used to force the execution of a password or other security routine at the beginning of the next communication.

Data transparency, or transmission of byte streams that include the Bizcomp escape sequence as data, can also be done easily. A special two-character sequence (ASCII STX followed by X when in control mode) is interpreted by the Bizcomp as a command to ignore any further commands in the data stream until told otherwise. This sequence is not passed along as data to the remote system.

Note that this implies that the escape sequence can no longer be used to terminate the call; instead, you must send a long space signal using the serial port's write break function. (This condition may be reversed later by sending the Bizcomp another command, STX Y, during control mode.)

Control Functions and Responses

Some of the Bizcomp 1022 commands and their responses are listed below. The list is not complete, but the functions which would be most commonly required are included:

Dial—The dial command is STX followed by D followed by the telephone number in ASCII, followed by CR. The telephone number may include hyphens (which are ignored) and colons (which cause a pause for an additional dial tone, as might be required with a business phone with which users dial 9 for outside lines). This command causes the specified number to be called only once, and dialing begins after the Bizcomp receives the CR. The Bizcomp goes "off hook" and waits for dial tone; upon detecting dial tone, it sends the digit 7 followed by CR to your computer. As the call proceeds, it sends either 1 CR

Listing 1. Pascal program that commands the Bizcomp Intelligent Modem to repeatedly dial a phone number. The program was written for the CP/M operating system and 8251 serial port; it is completely self-contained with respect to serial port I/O and may be shortened if your operating system provides these facilities.

```
        {Written for the Pascal MT+ compiler, this program   }
        {uses the following special features of the Pascal   }
        {which it supports:                                  }
        {       INP, OUT "arrays" for I/O                    }
        {       Hexadecimal constants ("$nn")                }
        {----------------------------------------------------}

VAR
   abort, connected: BOOLEAN;              {flags}
   phoneno: STRING;                        {Telephone number}
   femask,  prxrmask, ptxrmask: BYTE;      {Misc. bit masks}
   statport, dataport: INTEGER;            {I/O addresses}

{------------- CP/M Console Interface Routines ----------------------------}

{***** @BDOS *****}
EXTERNAL FUNCTION @bdos (func:INTEGER; parm:INTEGER): INTEGER;

{***** KEYPRESSED *****}
{Determine if a key on the console device has been pressed:}
FUNCTION keypressed: BOOLEAN;
BEGIN
        keypressed:= (@bdos(11,0) <> 0)
END {keypressed};

{***** KBDATA *****}
{Read a single character from the console device:}
FUNCTION kbdata: CHAR;
BEGIN
        kbdata:= CHR(@bdos(1,0))
END {kbdata};

{***** PUTCON *****}
{Write a single byte to the console device:}
PROCEDURE putcon (outchar: CHAR);
VAR dummy: INTEGER;
BEGIN
        dummy:= @bdos(2,ORD(outchar))
END {putcon};

{-------------- Serial Port Interface Routines ----------------------}

{***** INITPORT *****}
{Initialize the serial port:}
PROCEDURE initport;
BEGIN
   OUT[(statport)]:= CHR($80);
   OUT[(statport)]:= CHR($80);
   OUT[(statport)]:= CHR($40);
   OUT[(statport)]:= CHR($0CE);
   OUT[(statport)]:= CHR($37);
```

More →

Listing continued.

```
END {initport};

{***** BREAK *****}
{Check for framing error on serial port input:}
{Returns TRUE if framing error (i.e., break)  }
FUNCTION break: BOOLEAN;
BEGIN
   break:= ((INP[(statport)] & femask) <> 0);
END {break};

{***** MINPUT *****}
{Read a byte from the serial port:}
{Returns a CHAR which is the last byte received over the serial port}
{It is assumed that MIRDY has already been used to determine that a
 character was received.}
FUNCTION  minput: CHAR;
BEGIN
   minput:= INP[(dataport)];
END {minput};

{***** MOUTPUT *****}
{Write a character to the serial port, waiting for transmit ready:}
PROCEDURE moutput (odata:char);
BEGIN
   REPEAT UNTIL ((INP[(statport)] & ptxrmask) <> 0);
   OUT[(dataport)]:= odata;
END {moutput};

{***** MIRDY *****}
{Check for Input Ready condition on serial port input:}
{Returns TRUE if data is ready.}
FUNCTION mirdy: BOOLEAN;
BEGIN
   mirdy:= ((INP[(statport)] & prxrmask) <> 0);
END {mirdy};


{----------------- Intelligent Modem Interface Routine ---------------}

{***** DIAL *****}
{Dial the number specified, wait for answer or abort:}
PROCEDURE dial (digits: STRING);
VAR i: INTEGER;          {Loop index}
    resp1, resp2: CHAR; {Modem response bytes}
BEGIN
   abort:= false;
   connected:= false;
   resp1:= ' ';
   resp2:= ' ';
   moutput(CHR($02));    {Send STX character}
   moutput('R');         {Send repeat dial command}
   FOR i:= 1 to LENGTH(digits) DO moutput(digits[i]);{Send phone #}
   moutput(CHR($0D));    {Send CR}
   WHILE (NOT abort AND not connected) DO   {Loop until connected or aborted}
     BEGIN
      IF keypressed THEN
                         BEGIN {Abandon call}
                          moutput(CHR($02)); {Send STX to modem}
                          WRITELN ('---------- Aborted ----------');
                          abort:= true;
                         END;
      IF mirdy THEN      BEGIN
                          resp1:= resp2;  {Shift previous character if any}
                          resp2:= minput; {Get newest character}
                          IF ((resp1 = CHR($B1)) AND (resp2 = CHR($8D)))
                           THEN connected:= TRUE;
                         END;
    END;
END {dial};


{------------------ Mainline Program: -------------------------------}

BEGIN
   {System-dependent assignments... change as required for your system:}
   statport:= $05;      {Status port address}
   dataport:= $04;      {Data port address}
   femask:= $20;        {Framing Error mask bit}
   prxrmask:= $02;      {Receive Ready bit}
   ptxrmask:= $01;      {Transmit Ready mask bit}

   initport;            {Initialize/reset serial port}
   WRITELN ('*** CBBS Call-In Program ***');
   WRITELN ('Enter Telephone Number:');
   READLN (phoneno);    {Get phone number to call}
   WRITELN ('Enter any character to cancel call.');
   dial(phoneno);       {Dial it, wait for answer}
   WRITELN ('---------- Connected. ----------');
   putcon (CHR($07));   {Ring console bell.}

   {Send modem input to console, console data to modem, while connected:}
   IF NOT abort THEN
                  WHILE NOT break DO
                     BEGIN
                        IF mirdy THEN putcon(minput);
                        IF keypressed THEN moutput(kbdata);
                     END;

   WRITELN ('---------- Disconnected. ----------');

END {callcbbs}.
```


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to indicate that a compatible modem has answered the call or 2 CR to indicate that the call has failed (no answer or no modem at answering number). The program may assume that any data received after the 1 CR is from the remote terminal or system.

Repeat Dial—This command is similar to the dial command, except that the Bizcomp repeats the call attempt (until told to stop) if it is not successful (i.e., is not answered by a compatible modem). The command is STX followed by R followed by the telephone number (as above). The dial tone progress response (7 CR) is *not* given as it is with the dial command; the modem responds with 1 CR when an attempt is finally successful. Repeat dialing may be terminated by sending STX, to which the Bizcomp response is 2 CR. This function is useful for calling systems which are frequently busy, such as community bulletin boards. (The consequences of unwittingly using this command with a wrong number should be obvious, however.) Note that terminating this command requires a valid answer, positive action by your program or disconnection of power to the Bizcomp.

Enable/Disable Auto Answer—STX A enables automatic answering; the response is CR. STX K disables automatic answering, and the response is the same. If your serial port can control the Data Terminal Ready line to the Bizcomp, a "false" level will inhibit automatic answering unconditionally.

> Bizcomp isolates the user and his program from the difficult requirements involved in connecting a computer to the telephone system. . .

Enable/Disable Transparency—The sequence STX X will enforce transparency thereafter. It can only be set or reset while the Bizcomp is in command mode, which means that once it is set for a given call, it can't be reset. The reset command is STX Y. The response to both is CR.

Reset—Sending the ASCII character NUL to the Bizcomp resets it to the condition it had immediately after being turned on. You can get the same effect by sending a long space or break (100 ms or more) while the Bizcomp is in command mode. The response is a long space of 120 ms, which also occurs on power up.

Select Pulse/Tone Dial Mode—Initially, the Bizcomp is set for pulse dialing, which is compatible with most telephone systems. STX V will change it to use tone dialing until it is changed back with STX W (or it goes through a power-on reset). The response to both is CR.

Additional functions such as self-test, abort and interrogate stored telephone number, and functions related to TWX and leased line operation, are described in the complete and well-written reference manual.

A Simple Test

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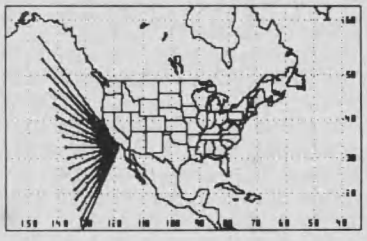

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Let Your Modem Do the Walking

Let's take a look at a program that uses some of the Bizcomp 1022's intelligence. Listing 1 shows a Pascal program that I use to automatically dial up a local community bulletin board system (CBBS), which is often busy. This program uses the Intelligent Modem's Repeat Dial command to call the required number over and over until there's an answer. The program then informs the user of the connection and transfers data from the console keyboard to the modem and from the modem to the console display. Input/output for the serial port (chip type 8251, in this case) is completely contained within the program, while services of the CP/M operating system are used to communicate with the console. When the Intelligent Modem indicates the connection is broken, a disconnect message is written on the console and the program exits to the operating system.

Summary

The Bizcomp is an excellent example of the application of the microprocessor to a fairly complex monitoring and control problem—data communications via the public telephone network. It successfully isolates the user and his program from all of the more difficult technical and legal requirements involved in connecting a computer to the telephone system, but without sacrificing any of the functions he needs for automatic operation. I expect this trend toward increased intelligence in computer peripherals to continue as the price of microprocessors continues to decrease. ■

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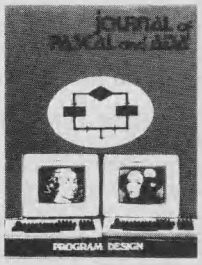

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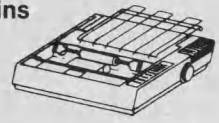

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By Dick Lutz

I was about to form a chapter of File Seekers Anonymous. It was getting that bad. I had a choice, actually: Either I could call SCORE for a retired librarian to bail me out, or I could activate a serious cataloging system.

I was spending too much time tracking down diskfiles. I print STAT *.* labels for all my disks, of course, and keep the less active disks in plastic sleeves in three-ring binders. But it wasn't enough—just too many disks. And despite my best efforts to use specific floppies for specific jobs and sub-jobs, some "articles" become books, some files get misfiled, and some "jobs" become careers (two disks at least).

```
FILENAME TYP  EX RC -----EXTENT-----
ARTALL   PCL  5A 0B0C0D0E 0F10
ARTMAIN  PCL  5A 11121314 1516
ARTSIDEB PCL  1A 1718
CONVERT  COM 08  0A
COPY     COM 10  29
DENSITY  COM 09  28
ED       COM 30  070809
PART     MAS 30  1A1B1C
PART     PCL 07  1D
PART2    MAS 01  1E
PART2    PCL 01  19
PENCIL   COM 30  020304
PIP      COM 37  24252627
STAT     COM 18  0506
14 FILES
A>
```

Table 1. Alphabetized output of CP/M disk cataloging program.

My solution is a CP/M catalog mastering system. What I use came from Elliam Associates on eight-inch single-density CP/M disks and cost $10, but it's based on public domain program material written by Ward Christensen, whose name keeps showing up at the top of some of the most useful programs available from the CP/M User's Group. You can order from CP/MUG at $8, but it's a good buy at the Elliam price of $10, too, and some useful additional programs are included.

Here's how it works. You give each of your disks (and each side if you're flipping your disks) a unique name/number that starts with a hyphen, like -LTRS.024 or -TAXES81.001.

```
...
DIETFORM.PCL,G+1222.001
DIETLINE.PCL,ARCH001.001
DIETLINE.PCL,G+1222.001
DIGEST.PCL,J+002.001
DISTEL.PCL,J+001.002
DISTEL.PCL,J+004.002
DITLLAST.PCL,CORRES.001
DITLOW.PCL,CORRES.001
DITLOW.PCL,IU32780.022
DOUGLAS.PCL,J+004.002
EXECSUM.PCL,J+001.002
EXECSUM.PCL,J+004.002
EXECSUM+.PCL,J+002.001
EXECSUM2.PCL,J+002.001
EXX2A1.PCL,IU+BQ.032
EXX2A1.PCL,IU+IIII.051
EXX2A1B.PCL,IU+BQ.032
EXX2A1B.PCL,IU+IIII.051
EXX2C3.PCL,J+NEWEX.001
```

Table 2. Sample of output of all files in master catalog.

You put it on the disk directory any way you like. Elliam's documentation recommends using ED to create an empty file on each target disk. So with the disk to be cataloged in the B: drive, you'd command ED B:-DISKNAM.000, and then respond to the prompting * with Q<cr> and answer Y to the "Quitting?" question. As with all CP/M file names, you're limited to an eight-space name and a three-space extension, so only seven characters can follow the hyphen, and only three numbers can follow the period.

Having done that, you can quickly catalog all you have. With your master catalog disk in the A: drive and a disk to be cataloged in the B: drive, you first command CATF B:*.* F. That yields an alphabetized list of files, with hex group locations on the disk, telling you the size of each file and its locations on the disk. (See Table 1.)

The trailing F in the command line causes a diskfile, NAMES.SUB, to be stored on the catalog master disk, consisting of all the filenames:

```
-CATART.001
ARTMAIN.PCL
ARTSIDEB.PCL
CAT.COM
CATF.COM
CATMAKR1.PCL
```

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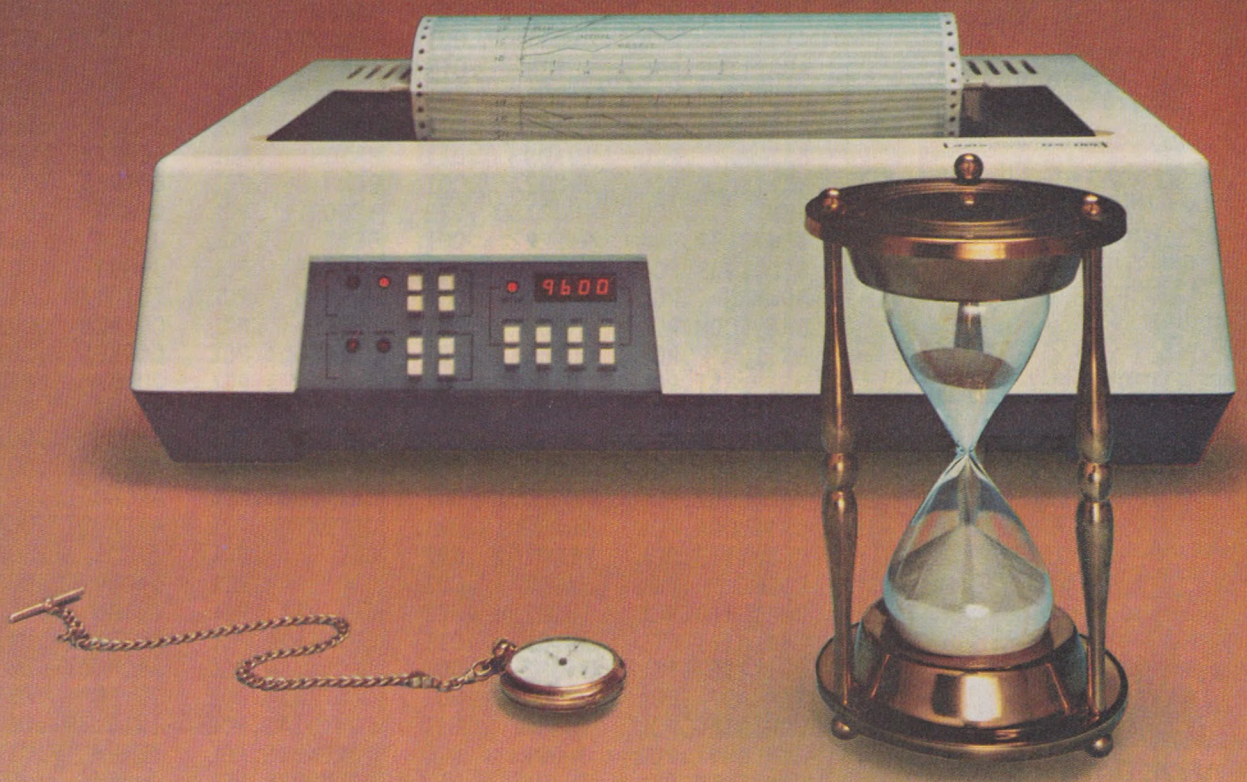
TIME-PROVEN PERFORMANCE



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Circle 7 on Reader Service card.

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CATU.COM
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COPY.COM
. . . etc.

When that's done, you command CATU, which merges the NAMES.SUB file into the MAST.CAT file on the disk in the A: drive. (It must be present when you start.)

When the process has been finished for all your disks, MAST.CAT will contain a full list of all your files, alphabetized by filename, with diskname. In raw form, a part of it looks like the sample in Table 2. Using that alone, I can see I have four "saves" of EXECSUM.PCL on three disks, J+001.002, J+004.002 and J+002.001. As long as I know where to find each of those disks (kept in my "J" book, as it happens), I can easily find a backup copy.

But the key program of the bunch is what makes this resource indispensable after a while. That program extracts specific listings from within MAST.CAT. For example:
Commanding
CAT *.* *.* #P
produces a printed (#P) master catalog list of all files on all disks.
Following that form,
CAT *.PCL *.*
produces a screen-only (no #P) display of all PCL-type files on all disks, or
CAT EX*.PCL J*.02* #P
produces a printed listing of all files named EX??????.PCL on all disks named -J??????.02?. In short, the standard CP/M conventions for wild-card use of * and ? apply.

Even better, it's possible to add a descriptive line:

NAME	DISK	NAME	DISK
A .PCL	IU32780 .021	A0016JUL.PCL	IU+BN .011
A0016JUL.PCL	IU10179 .041	A0017CPB.PCL	IU+BN .012
AOINSUR .PCL	PERFIN2 .002	AOPROBE .PCL	G+MMMM .001
AOSPEECH.PCL	IU10179 .041	ADLERNY .PCL	J+003 .002
AGREEMNT.PCL	IU32780 .022	AN79BTCH.PCL	G+GGG .002
AP .PCL	J+003 .001	APPENTTL.PCL	IU32780 .022
APPLE .PCL	IU10179 .041	ARCH0109.PCL	J+004 .001
ARCHLIST.PCL	J+004 .001	ARLEN .PCL	J+003 .001
AT&T .PCL	J+003 .001	AUG22TTL.PCL	IU10179 .041
AUGTITLE.PCL	IU+BN .011	AYR .PCL	J+002 .001
BANCROFT.PCL	J+002 .001	BARBER .PCL	IU+BQ .031
BARBER .PCL	IU10179 .042	BARDA .PCL	J+002 .001
BATCH .PCL	IU+BN .011	BATCH .PCL	PERFIN2 .002
BATTELLE.PCL	J+002 .001	BEN .PCL	CORRES .001
BEN .PCL	IU32780 .022	BEN0911 .PCL	G+GGG .002
BEN72279.PCL	G+1222 .001	BEST .PCL	J+004 .001
BILLINGS.PCL	G+1222 .001	BISHOP .PCL	J+003 .001
BOWMAN .PCL	IU+BQ .031	BOWMAN .PCL	IU10179 .042
BRANSCOM.PCL	J+003 .001	BROWN .PCL	CORRES .001
BSIT .PCL	CORRES .001	BSITFUL1.PCL	CORRES .001
BSITLAST.PCL	CORRES .001	BUDGSOF1.PCL	IU+BN .012
BUDSTAF1.PCL	IU+BN .012	CANADIAN.PCL	J+003 .001
CANISIUS.PCL	J+004 .001	CARTERF .PCL	J+003 .002
CARTERF .PCL	J+004 .002	CATALOG1.PCL	ARCH001 .001
CATALOG2.PCL	ARCH001 .001	CATALOG3.PCL	ARCH001 .001
CATALOG4.PCL	ARCH001 .001	CATBATCH.PCL	ARCH001 .001
CCNB1113.PCL	PERFIN2 .002	CDC .PCL	J+001 .002
CDC .PCL	J+002 .001	CDC .PCL	J+004 .002
CHAIN++D.PCL	IU32780 .022	CHAIN11 .PCL	IU+BN .012
CHAIN111.PCL	IU+BN .011	CHITESTR.PCL	IU10179 .042
CHITRIB .PCL	J+002 .001	CLOCKHOW.PCL	ARCH001 .001
COMCAST .PCL	J+004 .001	CONTCATG.PCL	IU+BN .012
CONTDIAG.PCL	IU+BN .011	CONTDIAG.PCL	IU10179 .041
CONTENT .PCL	J+001 .002	CONTNEWS.PCL	IU+BN .012
CONTSPEC.PCL	IU+BN .012	COSGROVE.PCL	J+003 .001
DATAFLOW.PCL	IU+BQ .031	DATAFORM.PCL	G+1222 .001
DATAGRUP.PCL	G+1222 .001	DATARES .PCL	J+003 .001
DAVIS .PCL	J+003 .001	DIETFORM.PCL	ARCH001 .001
DIETFORM.PCL	G+1222 .001	DIETLINE.PCL	ARCH001 .001
DIETLINE.PCL	G+1222 .001	EXECSUM .PCL	J+001 .002
EXECSUM .PCL	J+004 .002	EXECSUM+.PCL	J+002 .001
EXECSUM2.PCL	J+002 .001	FASTINFO.PCL	FFF .001
FASTSORT.PCL	FFF .001	FCC .PCL	J+004 .001
FELLOWS .PCL	G+GGG .002	FISK .PCL	CORRES .001
FISKFUL1.PCL	CORRES .001	FISKFUL2.PCL	CORRES .001
FISKLAST.PCL	CORRES .001	FLEMING .PCL	IU+BQ .031
FLOSCHMJ.PCL	IU+BN .011	FLOSCHMJ.PCL	IU10179 .041
FLOWSCHM.PCL	IU+BQ .031	FRIENDLY.PCL	J+003 .001
FUTURE .PCL	J+003 .001	GIC .PCL	J+002 .001
GLOSFEED.PCL	IU+BQ .031	GLOSSARY.PCL	IU+BQ .031
HARVEY .PCL	J+002 .001	HEF0919 .PCL	IU+BQ .032
IGAP .PCL	ARCH001 .001	IGAP2 .PCL	ARCH001 .001
IGAP3 .PCL	ARCH001 .001	INED .PCL	J+002 .001

Table 3. Sample catalog page.

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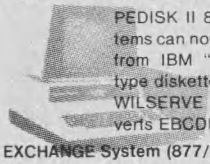

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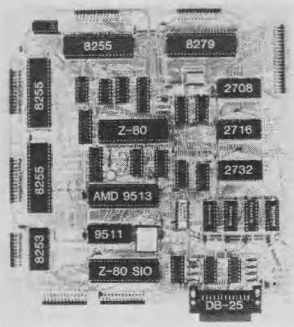

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CAT ????LAST.PCL ASM*.* March 19 last ASM versions #P

yields a printed master catalog of all files satisfying ????LAST.* on all disks satisfying the name specification ASM*.*, with each page headed by the label MARCH 19 LAST ASM VERSIONS. (See Table 3.)

Selective Catalogs

A little care in use of the three-digit disk number and the seven-space disk name can make this a very useful function. Rather than numbering disks sequentially, for example, you might use the first digit to categorize material by system users: 1 for you, 2, 3, 4 and so on for others who have access to your system. The second and third digits might then be used according to individual preferences: 1 for correspondence, 2 for writing projects, 3 for data-only disks, 4 for program development, and so on. Such a plan would require that you use the filenames as the distinctive identity of each disk, of course, since duplicate numbers could arise.

Any good system will work. The important thing is to be able to use commands like CAT PH06*.PCL LTRS81*.* #P to print carefully targeted catalogs. That command might produce a listing of all letters (LTRS diskname) to "PH" (in filename) written in June (06) on any day (06*) of 1981.

Because MAST.CAT specifies a group of "ignore" filenames, you can keep programs like STAT.COM, which may appear on every CP/M disk you have, from being listed in the catalogs you take. Names listed at the head of the MAST.CAT file, bounded by parentheses, will not appear when CAT commands produce library directories:

(ASM.COM
DDT.COM
DENSITY.COM
ED.COM
PENCIL.COM
PIP.COM
STAT.COM)

You create that file in advance, of course; it's the first entry in MAST.CAT, and it must be present when cataloging commences. If you want all files listed, something like (DUMMY.FIL) must nonetheless be there, because CAT expects it.

The catalog can be updated, of course. When you've deleted or added files to a disk, you repeat the cataloging process. CATF B:*.* creates a new NAMES.SUB file, which when merged (with the command CATU) into MAST.CAT produces an add/delete display like this:

ADD: ARTMAIN.PCL
ADD: ARTSIDEB.PCL
DEL: NOTES.ASC
ADD: PART.MAS
DEL: TEMP4.PCL
MAST.CAT HAS 1030 ENTRIES.

There's an auxiliary program with the Elliam set, called CATS. It's provided in single-density form, but with an ASM form so it can easily be converted to double-density operation. Written originally by L. E. Hughes as SAP, and also available from CP/MUG, it sorts and packs the directory of a CP/M disk. After it's been used, the built-in DIR command yields an alphabetized listing of files. Then, because open (erased) directory entries are eliminated by CATS, anything out of alpha order at the end of a DIR listing is clearly something added since the last CATS run.

The master catalog package can change your disorganized ways. From Elliam Associates or the CP/M User's Group, it's a good buy . . . a CP/M "Super Utility."■

Sources

"Membership" in the CP/M User's Group, which is not affiliated with Digital Research (owner of the CP/M trademark), comes with purchase of the $6 catalog of 80 (and growing) disks available at $8 each. Volume 40 contains the master catalog system, and can probably be purchased for $8 without first purchasing the catalog. Write CP/M User's Group, 1651 Third Ave., New York City, NY 10028.

Additions to the catalog are published in *Lifelines*, $24/year from Lifelines Publishing at the same address (also the address for the software house, Lifeboat Associates).

For $10 (plus $1.50 postage and handling) you can buy a disk containing the master catalog system and instructions from Elliam Associates, 24000 Bessemar St., Woodland Hills, CA 91367.

Elliam has other interesting programs available, and they can be packaged with the master catalog system, so you may want to write for information before sending your $11.50.■

Let Your Machine Do the Work

To make the cataloging process as easy as possible, you can automate with a SUBMIT routine. The best bet is to name all your disks in advance, by putting a null diskname file in the directory of each disk. Then, Version One applies, and once the submit file is running all you need do is feed the disks to be cataloged to the B: drive.

(Note that the master catalog disk in drive A: must contain the necessary files, including SUBMIT .COM, CATMAKR1.SUB or CATMAKR2.SUB, CATF.COM, CATU .COM, CATSDD.COM or any other utility to be placed on the disk in the B: drive.)

CATMAKR1.SUB (Version one). If you've already named each disk you plan to catalog, this SUBMIT file will save a lot of keystrokes. Invoked with the command A>SUBMIT CATMAKR1, it runs through the disks you put in the B: drive. Your only job is to keep up. The lines in lowercase are optional.

```
dir b:
era b:temp*.*
pip b:=a:catsdd.com[v]
CATF B:*.* F
stat con:=tty:
type bell.asc
stat con:=crt:
CATU
SUBMIT CATMAKR1
```

You need the first line only if you intend to use the second or third line. The third can be used if you want to add a new system utility to every disk being cataloged, while the second is useful if you want to delete old TEMP*.* files. I use it because during document editing I use TEMP1, TEMP2, etc., as an audit trail, and when I forget to erase the temporary files, they litter my disks.

The fifth through seventh lines of CATMAKR1.SUB are useful if you want to be prompted for each new disk. Create the file BELL.ASC containing only a control G (bel), and change disks when you hear the warning. The preceding and following STAT commands switch output from CRT to printer and back.

CATMAKR2.SUB Version two is used if the target disk is to be given a name during the run. The invocation is in the form SUBMIT CATMAKR2 DISKNAM.NUM in which DISKNAM is the title you've chosen for the target disk. Again, the lines in lowercase are optional.

```
DIR B:
era b:temp*.*
ED B:-$1 (In CP/M 1.x you must respond
          to the prompt * with Q<cr>
          Y; in the CP/M 2.x, you can
          use the XSUB capability, and
          include them in the controlling
          submit file.)
stat b:*.*
pip b:=a:catsdd.com[v]
CATF B:*.* F
CATU
```

In this form, the CATMAKRx submit routine doesn't run continuously. It would be relatively easy, however—if you happen to have an enormous cataloging job to do and wish to automate—to write a Basic program which is invoked during the SUBMIT run with the line MBASIC DISKNAMR in place of ED B:-$1.

Its task would be to name a disk by opening and closing a null file on the target disk, make a diskfile note (on the master catalog disk in A:) of the name it used, and then return to SYSTEM (to control of the submit file). Each time it's invoked, the Basic program would be required to update the title to be used by incrementing it one step. When this is done, the last line of the CATMAKR2.SUB file should be SUBMIT CATMAKR2, as in the continuous-run version one.■

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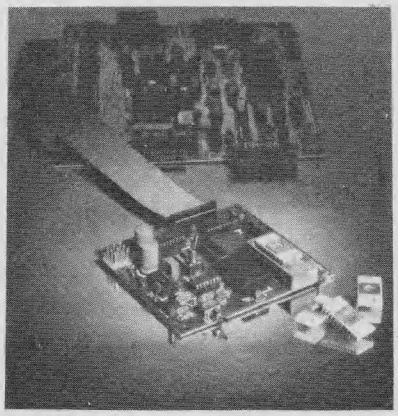

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Tune Up Your Basic Programs

For the programmer looking to sell his software, these programming tips show you how to increase the speed of your Basic programs and could mean the difference between a marketable and non-marketable product.

By Henry A. Seymour

The most common programming language is still Basic, a language which is simple in syntax but has enough power to perform a variety of operations. Basic was designed as an interpreter, to scan each statement, convert it into machine code and then execute that code. Because Basic was not intended to be a production software tool, there was no need to save the object code or to be overly concerned with data structures, control structures and optimization.

Basic, however, has grown beyond the purposes of its designers and now is used in homes and businesses. An entire industry has evolved that offers software spanning the full range of applications: business programs, scientific programs and games. For programming for personal use in any of these fields, slight inefficiencies may not be critical. When marketing a program, however, computer time and memory requirements are important. Sometimes one or both may be the difference between a program that is marketable and one that is not.

Optimization is an important technique which will make the most efficient use of computer time and memory. Computer time and memory use are sometimes at opposite ends of the scale, requiring the programmer to choose which is more important.

I'll discuss some programming techniques that you could use to improve the performance of a Basic program. Although there have been some Basic compilers written, I'm assuming in this article that you're using a Basic interpreter.

Constant Folding

Given the intent that L will never change, a typical set of instructions would be,

```
100  LET L = 5
...
400  LET K = L + 3
```

The interpreter has no way of improving this type of code because it evaluates only one instruction at a time. Each time statement 400 is executed, the interpreter generates the code to load the constant L (5) and add 3. The improved version is,

```
400  LET K = 8
```

When using an interpreter it is often more costly to use constants instead of variables. Consider the following:

```
500  FOR I = 1 TO K
600  LET L = L + 4235
700  NEXT I
```

During each iteration of lines 500 through 700, the constant 4235 is rescanned and converted into an internal form. Even though 4235 is a constant, execution time would be faster if it were placed into a variable name such as,

```
400  LET N = 4235
500  FOR I = 1 TO K
600  LET L = L + N
700  NEXT I
```

This technique expands the program size by one line for each constant, but the increase in speed could be worth it. The amount of computer time saved depends on the number of digits in the constants and the number of times they must be converted.

Reduction in Strength

Each arithmetic operation (addition, subtraction, multiplication, division and exponentiation) requires a fixed amount of time to perform. Knowing the cost of each operator can help the programmer choose the most efficient way to state arithmetic expressions. For example, in the case of exponentiation,

```
100  LET A = B ** 2
```

is more expensive than,

```
100  LET A = B *B
```

yet they are mathematically equivalent.

Multiplication is more expensive than additon; therefore,

```
100  LET A = B * 2
```

is more expensive than,

```
100  LET A = B + B
```

Division is more expensive than multiplication; therefore,

```
100  LET A = X/2
```

should be replaced by,

```
100  LET A = X * .5
```

The time requirement for each of the arithmetic instructions is machine dependent. The amount of time saved by these programming techniques depends on the time requirements of the individual instructions and the frequency of their occurrence.

Address correspondence to Dr. Henry A. Seymour, Senior Designer, Computer Systems, Computer Services Department, Martin Marietta Aerospace, Box 29304, Dept. 3412, New Orleans, LA 70189.

Reduced Expressions

Many times an expression is stated in a form such as,

```
100  A = X * Y + X * Z
```

The variable X, however, will be involved in two multiplications. A more efficient alternative would be,

```
100  LET A = X * (Y + Z)
```

This reduces the expression to one addition and one multiplication. In general, you should analyze each expression to determine whether any part of it could be represented by a less expensive arrangement.

Common Subexpressions

A common subexpression can occur throughout a program and consume a large amount of computer time and memory. The following contains a common subexpression, X + Y.

```
100  LET A = X + Y + W
200  LET B = R+ X + Y
```

The improved version would evaluate the subexpression only once:

```
100  LET T = X + Y
200  LET A = T + W
300  LET B = R + T
```

Although the improved version is one statement longer, it contains only three additions, compared to four in the original. The amount of computer time and memory saved depends on the number of expressions that can be substituted.

Subexpressions are also useful in working with subscripted variables. For example,

```
100  LET A (L + M) =A (L + M) + W
```

has the subscript L + M which would be evaluated twice. This could be improved by,

```
100  LET T = L + M
200  LET A (T) = A (T) + W
```

In general, time and memory can be saved by eliminating repetitious evaluations of expressions.

Multiple Jumps

The use of goto statements has recently come under criticism. It is true that their indiscriminate use makes subsequent modifications difficult. Many of the problems with the goto statement, however, are due to its misuse. An improper use of a goto statement, causing a jump over jump, is,

```
100  IF X > Y THEN 300
200  GOTO 500
300  LET E = E + N
...
500  ...
```

An improved version is,

```
100  IF X <= Y THEN 500
200  LET E = E + N
...
500...
```

Simply reverse the logic of the if...then statement to improve speed and readability.

Loop Unrolling

If a program contains a loop, such as

```
100  FOR L = 1 TO 64
200  LET A (L) = P
300  NEXT L
```

execution time can be improved, if memory is available, as follows:

```
100  FOR L = 1 TO 64 STEP 2
200  LET A (L) = P
300  LET A (L + 1) = P
400  NEXT L
```

Line 200 was expanded to two statements, doubling the amount of work done in each iteration of the loop. The time required for completion of

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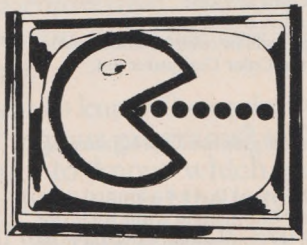

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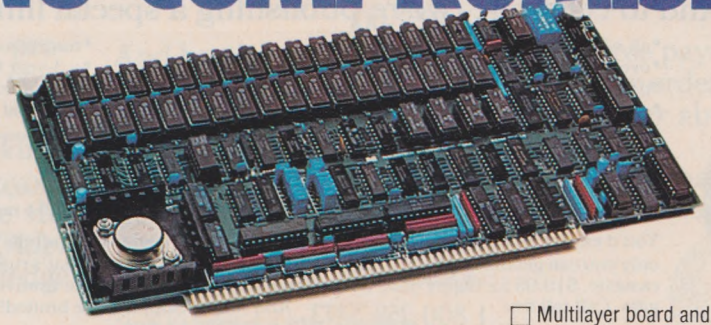

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the loop was reduced by 50 percent. The decision was made to increase speed at the cost of memory.

Loop Jamming

Matrix operations are used in many programs and, in many instances, are adjacent to each other. For example, a matrix initialization might be,

```
100  FOR C = 1 TO 5
200  FOR R = 1 TO 5
300  LET A (R, C) = 4
400  NEXT R
500  NEXT C
600  FOR C = 1 TO 5
700  LET A (C, C) = 3.1416
800  NEXT C
```

In this example there are two operations on matrix A. First, each cell of the matrix is set to 4. Second, the diagonal from A(1,1) to A(5,5) is set to 3.1416. Each loop requires a test for completion, so statement 400 will be performed 25 times, statement 500 will be performed five times and 800, five times.

But the second loop can be included in the first, thus reducing the number of tests. For example,

```
100  FOR C = 1 TO 5
200  FOR R = 1 TO 5
300  LET A (R, C) = 4
400  NEXT R
500  LET A (C, C) = 3.1416
600  NEXT C
```

In this example only one matrix is involved; however, it is possible to operate on more than one at a time if they have the same dimensions. For example,

```
100  FOR C = 1 TO 5
200  FOR R = 1 TO 7
300  FOR A (R, C) = 6
400  NEXT R
500  LET B (C) = 8
600  NEXT C
```

In the example above, matrix B has the same number of rows and columns as matrix A.

Code Hoisting

Operations are sometimes mistakenly placed inside a loop. For example,

```
100  FOR L=1 TO 5
200  LET D=X+Y
300  LET A (L)=A (L)+R
400  NEXT L
```

The value of D does not change, but it is recalculated during each pass of the loop. An improved version is,

```
100  LET D=X+Y
200  FOR L=1 TO 5
300  LET A (L)=A (L)+R
400  NEXT L
```

The amount of time saved is the product of the time required to execute the instruction and the number of times it is executed.

Branching

Making a decision to branch to some other part of a program can be more expensive than you might imagine. Consider the following:

```
100  IF B=1 THEN 1400
200  IF B=2 THEN 1500
300  IF B=3 THEN 1600
```

If B is 3 most of the time, then the order of testing should be rearranged:

```
100  IF B=3 THEN 1600
200  IF B=1 THEN 1400
300  IF B=2 THEN 1500
```

A significant amount of speed might be gained by reordering if...then statements, at no increase in memory use.

The same applies to on...goto statements.

Summary

Some code improvement features are available in the new Basic compilers, but when using an interpreter it is your responsibility to program efficiently. ■

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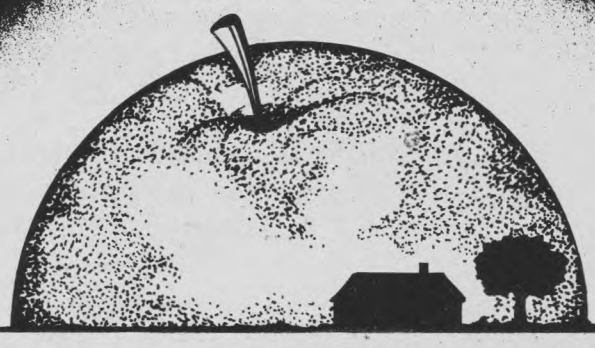

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Aide for Harried Programmers

Hexadecimal, split-octal, decimal. . . got your head turning around in circles? Here's a programming tool to help you convert various computer number systems in a flash.

By J. T. Donlon

Rare is the computer user or programmer who can readily evaluate and calculate in number systems other than the decimal system. Even if you understand the theories of hexadecimal, octal, split-octal and binary systems, you may still find them as difficult as a foreign language if you're an occasional user. Even accomplished programmers resort to special calculators and software to work accurately and efficiently with these number systems. The accompanying conversion aid (see Fig. 1) provides an alternative method for quickly dealing with numbers and addresses to 64K. Use simple interpolation procedures for numbers greater than 256_{10}.

Although a basic understanding of the theory of the binary, octal, split-octal and hexadecimal number systems is helpful, you don't need it to use the conversion aid. This technique requires only tabular cross-referencing and regular decimal addition or subtraction for interpolation. I've provided an example of each type of conversion for speedy comprehension of the procedures involved (see Examples 1 through 7).

Fig. 1 covers the entire 64K address field of the normal microcomputer. This corresponds to all numbers that can be coded in two eight-bit words or bytes. In order to compress all this information into a one-page table, I've split each address or number in two; this corresponds to how the numerical value is stored and handled

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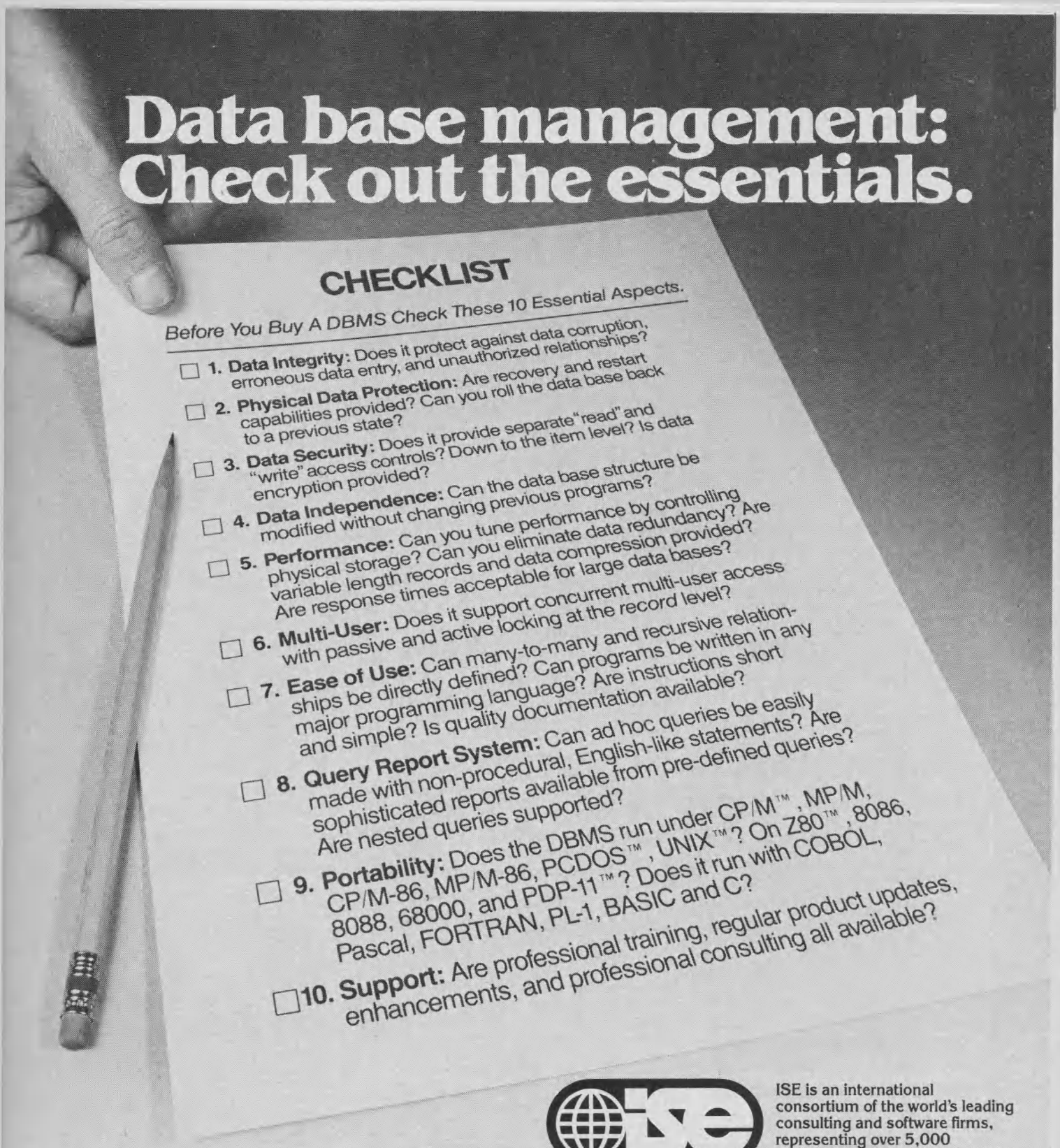
0	HEX	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
	OCT	0_8	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17
	DEC	0_{10}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	DEC	0_{10}	256	512	768	1024	1280	1536	1792	2048	2304	2560	2816	3072	3328	3584	3840
1	HEX	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
	OCT	20	21	22	23	24	25	26	27	30	31	32	33	34	35	36	37
	DEC	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	DEC	4096	4352	4608	4864	5120	5376	5632	5888	6144	6400	6656	6912	7168	7424	7680	7936
2	HEX	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
	OCT	40	41	42	43	44	45	46	47	50	51	52	53	54	55	56	57
	DEC	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
	DEC	8192	8448	8704	8960	9216	9472	9728	9984	10240	10496	10752	11008	11264	11520	11776	12032
3	HEX	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
	OCT	60	61	62	63	64	65	66	67	70	71	72	73	74	75	76	77
	DEC	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
	DEC	12288	12544	12800	13056	13312	13568	13824	14080	14336	14592	14848	15104	15360	15616	15872	16128
4	HEX	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
	OCT	100	101	102	103	104	105	106	107	110	111	112	113	114	115	116	117
	DEC	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
	DEC	16384	16640	16896	17152	17408	17664	17920	18176	18432	18688	18944	19200	19456	19712	19968	20224
5	HEX	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
	OCT	120	121	122	123	124	125	126	127	130	131	132	133	134	135	136	137
	DEC	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
	DEC	20480	20736	20992	21248	21504	21760	22016	22272	22528	22784	23040	23296	23552	23808	24064	24320
6	HEX	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
	OCT	140	141	142	143	144	145	146	147	150	151	152	153	154	155	156	157
	DEC	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
	DEC	24576	24832	25088	25344	25600	25856	26112	26368	26624	26880	27136	27392	27648	27904	28160	28416
7	HEX	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
	OCT	160	161	162	163	164	165	166	167	170	171	172	173	174	175	176	177
	DEC	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
	DEC	28672	28928	29184	29440	29696	29952	30208	30464	30720	30976	31232	31488	31744	32000	32256	32512
8	HEX	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
	OCT	200	201	202	203	204	205	206	207	210	211	212	213	214	215	216	217
	DEC	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
	DEC	32768	33024	33280	33536	33792	34048	34304	34560	34816	35072	35328	35584	35840	36096	36352	36608
9	HEX	90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
	OCT	220	221	222	223	224	225	226	227	230	231	232	233	234	235	236	237
	DEC	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
	DEC	36864	37120	37376	37632	37888	38144	38400	38656	38912	39168	39424	39680	39936	40192	40448	40704
A	HEX	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
	OCT	240	241	242	243	244	245	246	247	250	251	252	253	254	255	256	257
	DEC	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
	DEC	40960	41216	41472	41728	41984	42240	42496	42752	43008	43264	43520	43776	44032	44288	44544	44800
B	HEX	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
	OCT	260	261	262	263	264	265	266	267	270	271	272	273	274	275	276	277
	DEC	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
	DEC	45056	45312	45568	45824	46080	46336	46592	46848	47104	47360	47616	47872	48128	48384	48640	48896
C	HEX	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
	OCT	300	301	302	303	304	305	306	307	310	311	312	313	314	315	316	317
	DEC	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
	DEC	49152	49408	49664	49920	50176	50432	50688	50944	51200	51456	51712	51968	52224	52480	52736	52992
D	HEX	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
	OCT	320	321	322	323	324	325	326	327	330	331	332	333	334	335	336	337
	DEC	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
	DEC	53248	53504	53760	54016	54272	54528	54784	55040	55296	55552	55808	56064	56320	56576	56832	57088
E	HEX	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
	OCT	340	341	342	343	344	345	346	347	350	351	352	353	354	355	356	357
	DEC	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
	DEC	57344	57600	57856	58112	58368	58624	58880	59136	59392	59648	59904	60160	60416	60672	60928	61184
F	HEX	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF
	OCT	360	361	362	363	364	365	366	367	370	371	372	373	374	375	376	377
	DEC	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
	DEC	61440	61696	61952	62208	62464	62720	62976	63232	63488	63744	64000	64256	64512	64768	65024	65280

Fig. 1. Computer number systems conversion aid.

Address correspondence to James T. Donlon, 135 Stoney Ridge Drive, Longwood, FL 32750.

Data base management: Check out the essentials.



CHECKLIST

Before You Buy A DBMS Check These 10 Essential Aspects.

☐ **1. Data Integrity:** Does it protect against data corruption, erroneous data entry, and unauthorized relationships?

☐ **2. Physical Data Protection:** Are recovery and restart capabilities provided? Can you roll the data base back to a previous state?

☐ **3. Data Security:** Does it provide separate "read" and "write" access controls? Down to the item level? Is data encryption provided?

☐ **4. Data Independence:** Can the data base structure be modified without changing previous programs?

☐ **5. Performance:** Can you tune performance by controlling physical storage? Can you eliminate data redundancy? Are variable length records and data compression provided? Are response times acceptable for large data bases?

☐ **6. Multi-User:** Does it support concurrent multi-user access with passive and active locking at the record level?

☐ **7. Ease of Use:** Can many-to-many and recursive relationships be directly defined? Can programs be written in any major programming language? Are instructions short and simple? Is quality documentation available?

☐ **8. Query Report System:** Can ad hoc queries be easily made with non-procedural, English-like statements? Are sophisticated reports available from pre-defined queries? Are nested queries supported?

☐ **9. Portability:** Does the DBMS run under CP/M™, MP/M, CP/M-86, MP/M-86, PCDOS™, UNIX™? On Z80™, 8086, 8088, 68000, and PDP-11™? Does it run with COBOL, Pascal, FORTRAN, PL-1, BASIC and C?

☐ **10. Support:** Are professional training, regular product updates, enhancements, and professional consulting all available?

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Circle 38 on Reader Service card.

Problem: Convert $30,000_{10}$ to split-octal.
First Cross Reference $29,952_{10} = 165_8$ MSB
Interpolation $30,000 - 29,952 = 048_{10}$
Second Cross Reference $048_{10} = 60_8$ LSB
Answer: $30,000_{10} = 165_8/060_8$ (split-octal)

Example 1.

Problem: Convert $30,000_{10}$ to hexadecimal.
Same method as example 1 except,
$29,952_{10} = 75_{16}$ MSB
$048_{10} = 30_{16}$ LSB
Answer: $30,000_{10} = 7530_{16}$

Example 2.

Problem: Convert $165_8/060_8$ (split-octal) to decimal.
First Cross Reference $165_8 = 29,952_{10}$ MSB
Second Cross Reference $060_8 = 048_{10}$ LSB
Interpolation $29,952 + 048 = 30,000_{10}$
Answer: $165_8/060_8 = 30,000_{10}$

Example 3.

Problem: Convert $165_8/060_8$ to hexadecimal.
Same method as example 3 except,
$165_8 = 75_{16}$ MSB
$060_8 = 30_{16}$ LSB
Answer: $165_8/060_8 = 7530_{16}$

Example 4.

Problem: Convert $EA60_{16}$ to decimal.
First Cross-Reference $EA_{16} = 59,904_{10}$ MSB
Second Cross-Refernce $60_{16} = 096_{10}$ LSB
Interpolation $59,904 + 096 = 60,000_{10}$
Answer: $EA60_{16} = 60,000_{10}$

Example 5.

Problem: Convert $EA60_{16}$ to split-octal.
Same method as example 5 except,
$EA_{16} = 352_8$ MSB
$60_{16} = 140_8$ LSB
Answer: $EA60_{16} = 352_8/140_8$

Example 6.

in eight-bit computers. The split results in a least significant byte (LSB) and a most significant byte (MSB).

The aid (Fig. 1) can now be set up as a 16 × 16 matrix with hexadecimal

Problem: Convert $352_8/140_8$ to octal (using Fig. 3).

	MSB								LSB							
	3		5		2		1		4		0					
Step 1.	1	1	1	0	1	0	1	0	0	1	1	0	0	0	0	0
Step 2.	1		6		5		1		4		0					

Answer: $352_8/140_8 = 165140_8$

Note: Octal spans the boundary between the MSB and LSB and does not permit separate manipulation of the eight-bytes, in particular the MSB. The easy way to get around this is to use binary as an intermediate step in any conversion involving octal.

Example 7.

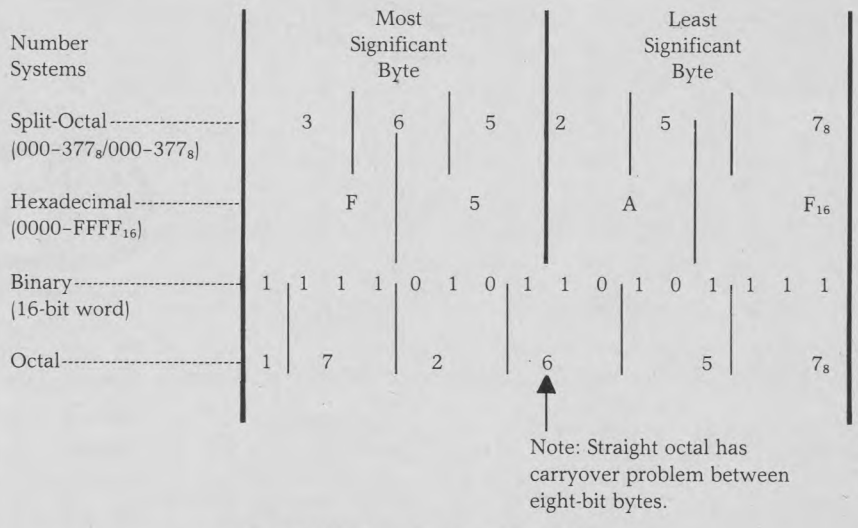

Fig. 2. Typical number systems relationship.

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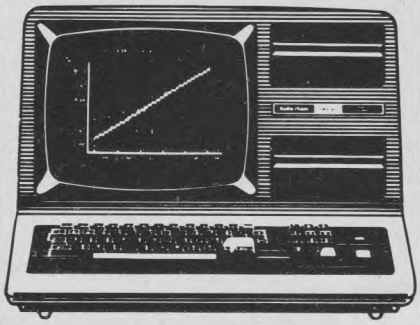

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Hexadecimal	Binary				Octal
0_{16}	0	0	0	0	0_8
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	10
9	1	0	0	1	11
A	1	0	1	0	12
B	1	0	1	1	13
C	1	1	0	0	14
D	1	1	0	1	15
E	1	1	1	0	16
F_{16}	1	1	1	1	17_8

Fig. 3. Binary, octal and hexadecimal codes.

indices. The first hexadecimal digit of a byte is located by the vertical index, and the second hexadecimal digit by the horizontal index. Each hexadecimal number is repeated as the first number at each intersection of the matrix—I set it up this way to make the conversion aid easy to use.

The second number at each intersection is the octal number for the equivalent LSB. For split-octal, this octal number also applies to an equivalent MSB number. The third number at each intersection is the decimal value for the LSB; the fourth number is the decimal value for the MSB. This helps you relate your familiarity with the decimal system to the other number systems.

The Heath Company uses the split-octal number system, which treats each eight-bit binary byte separately—just as it is stored and handled in an eight-bit computer system. Fig. 2 shows how a typical 16-bit (two-byte) binary address or number is represented in each popular number system. Fig. 3 provides a detailed comparison of binary, octal and hexadecimal codes.

The splitting technique doesn't work for octal numbers greater than 377_8, because the hundreds-digit lies across the boundary between the MSB and LSB (see Fig. 2). When you're working with two-byte values, it's better to use hexadecimal or split-octal numbers because you can directly convert each eight-bit byte from binary without manipulating bits. ■

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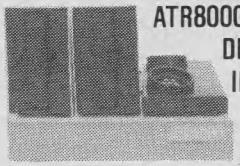

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CONVERSIONS

Each month Microcomputing *will publish Apple, Atari, Commodore, Heath or IBM PC translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.*

The following listings are translations of the stock market simulation game, "Black Friday," published in the September 1982 issue of *Microcomputing* (p. 88). The first, for the Apple, was submitted by Vincent R. Johns (5117 SE 55th St., Oklahoma City, OK 73135). Gary Stachelski's (818 15th Ave., Prospect Park, PA 19076) translation for the Heath H89 follows.

Next month, IBM PC owners, it will be your turn. We will publish a Black Friday translation for the IBM Personal Computer.

```
100  REM ***** APPLE BLACK FRIDAY *******
110  REM
120  REM   ROBERT W. BAKER
130  REM
135  REM   APPLE VERSION BY V R JOHNS
140  REM
150  REM
160  REM *********************************
170 :
175 BL$ =  CHR$ (7):BS$ =  CHR$ (8):LF$ =  CHR$ (10): REM BELL, BACKSPACE, AND
     LINE FEED
181  DEF  FN VC(X) =  PEEK (37) + X + 1: REM VERTICAL CURSOR POSITION
185  POKE 33,40: REM SELECT FULL PAGE
190  HOME : PRINT LF$;LF$;LF$;LF$;"%%%  BLACK FRIDAY STOCK MARKET GAME  %%%"
195  GOSUB 3000: REM PRINT MESSAGE TO BE READ DURING INITIALIZATION
200  DIM A(36,10),U(11,9),E(11,9),M(4,12)
210  FOR N = 1 TO  PEEK (78):X =  RND (1): NEXT N: REM RANDOM NUMBER
220 S$ = "*HIBXP SP ODMRD SO BT KA ZE BPL*"
240  GOSUB 1080: REM GAME DATA
290  FOR R = 1 TO 2: FOR N = 1 TO 11: FOR J = 1 TO 9: READ X
300  IF R = 1 THEN U(N,J) = X
310  IF R = 2 THEN E(N,J) = X
320  NEXT J: NEXT N: NEXT R
330  DATA   5,1,0,4,7,0,0,2,6,3
340  RESTORE : FOR N = 1 TO 10: READ I(N):F(N) = 0:T(N) = 100: NEXT N
350  FOR N = 1 TO 4: FOR J = 2 TO 12:M(N,J) = 0: NEXT J:M(N,1) = 5000: NEXT N
360  FOR N = 1 TO 36:A(N,10) = 0: NEXT N:Y = 0
365  VTAB 24: PRINT "DO YOU WANT INSTRUCTIONS   N";BS$;BS$;: INPUT R1$: IF R1$
     <  > "N" THEN  GOSUB 3100
370  HOME : PRINT LF$;LF$;LF$;LF$;"HOW MANY PLAYERS (1 TO 4)   1";BS$;BS$;
380 INPUT R$:P =  VAL (R$): IF P > 4 OR P < 1 THEN 370
382  REM ===============
385  REM COMPUTE PRICES
387  REM ===============
390  HOME : PRINT LF$;LF$;"*** COMPUTING NEXT YEAR ***";LF$;LF$:D =  INT (11 *
      RND (1) + 1)
400 C =  INT (36 *  RND (1) + 1)
410  IF A(C,10) = 1 THEN 400
450  FOR N = 2 TO 10: IF  INT (C / 2) <  >  INT ((C - 1) / 2) THEN 470
460 R$ = "BULL":F(N) = A(C,N - 1) + U(D,N - 1): GOTO 480
470 R$ = "BEAR":F(N) = A(C,N - 1) + E(D,N - 1)
474  REM ===================
475  REM CHECK STOCK SPLITS
477  REM ===================
480 T(N) = T(N) + F(N): IF T(N) < 150 GOTO 530
490  PRINT "*** "; MID$ (S$,3 * (N - 1) + 2,3);" STOCKS SPLIT ***"
500 J =  INT (T(N) / 2): IF T(N) / 2 = J THEN T(N) = J: GOTO 520
510 T(N) = J + 1
520  FOR J = 1 TO P:M(J,N + 1) = M(J,N + 1) * 2: NEXT J
522  REM ===================
525  REM CHECK BANKRUPTCIES
527  REM ===================
530  IF T(N) > 0 THEN 570
540 T(N) = 100: FOR J = 1 TO P:M(J,N + 1) = 0: NEXT J
550  PRINT BL$;"*** "; MID$ (S$,3 * (N - 1) + 2,3);" WENT BANKRUPT ***"
560  PRINT "THESE STOCKS ARE BEING SURRENDERED"
570  NEXT N
572  REM ===============
575  REM UPDATE DISPLAY
577  REM ===============
580  FOR N = 1 TO P:M(N,12) = 0
590  FOR J = 1 TO 10: IF T(J) >  = 50 THEN M(N,12) = M(N,12) + (I(J) * M(N,J +
     1))
600  NEXT J:M(N,1) = M(N,1) + M(N,12): NEXT N:Y = Y + 1
610  GOSUB 620: GOTO 680: REM PRINT DISPLAY
615  REM === PRINT DISPLAY ===
620  HOME : PRINT "%%%  YEAR  ";Y;"  %%%%  ";R$;" MARKET  %%%"
630  IF Y = 11 THEN  VTAB  FN VC( - 1): HTAB 5: PRINT "CLOSING  "
640  PRINT : PRINT  TAB( 6);"+/-   NEW   --PLAYER HOLDINGS---"
650  PRINT "STK  CHNG PRICE .1..  .2..  .3..  .4..": PRINT
660  FOR X = 1 TO 10: GOSUB 950: NEXT X: PRINT : PRINT "DIV'S THIS YR";
670  FOR J = 1 TO P: PRINT  TAB( 15 + ((J - 1) * 6));M(J,12);: NEXT J: PRINT :
      PRINT : GOSUB 980
675  RETURN
680  IF Y = 11 THEN 1020
682  REM ===================
685  REM PLAYER TRANSACTIONS
687  REM ===================
690  FOR N = 1 TO P
700  GOSUB 880
710  INVERSE : PRINT "PLAYER "N;: NORMAL : PRINT "(B=BUY,S=SELL,D=DONE,L=LIST)
     ?";BS$;BS$;: INPUT R1$: IF R1$ = "D" THEN 870
720  IF R1$ = "S" GOTO 780
725  IF R1$ = "L" THEN  GOTO 2000
730  IF R1$ <  > "B" GOTO 700
735  REM === BUY SHARES ===
740  GOSUB 900: PRINT "NUMBER OF SHARES TO BUY   ?";BS$;BS$;
750  INPUT R1$:R =  VAL (R1$): IF R < 1 THEN  PRINT BL$;"BAD INPUT!": GOTO 820
760  IF R * T(X) > M(N,1) THEN  PRINT BL$;"NOT ENOUGH MONEY!": GOTO 820
770 M(N,X + 1) = M(N,X + 1) + R:M(N,1) = M(N,1) - (R * T(X)): GOTO 850
775  REM === SELL SHARES ===
780  GOSUB 900: PRINT "NUMBER OF SHARES TO SELL   ?";BS$;BS$;
790  INPUT R1$:R =  VAL (R1$): IF R < 1 THEN  PRINT BL$;"BAD INPUT!": GOTO 820
800  IF R <  = M(N,X + 1) THEN M(N,X + 1) = M(N,X + 1) - R:M(N,1) = M(N,1) + (R
      * T(X)): GOTO 850
810  PRINT BL$;"NOT ENOUGH SHARES!"
```

Listing continued.

```
820  FOR X = 1 TO 300: NEXT X
840  GOTO 700
845  REM === UPDATE DISPLAY FOR TRANSACTIONS ===
850  VTAB 5 + X: GOSUB 950
860  VTAB 19: GOSUB 980: GOTO 700
870  NEXT N: GOTO 390
872  REM ======================
875  REM *-*-*  S U B R O U T I N E S  *-*-*
877  REM ==================================
880  GOSUB 890: FOR J = 1 TO 4: GOSUB 1000: NEXT J
890  VTAB 20: RETURN
900  PRINT "STOCK SYMBOL  ?";BS$;BS$;: INPUT R1$:R1$ =  LEFT$ (R1$ + "   ",3)
910 W1 = 0: FOR J = 0 TO 9:X = J + 1
920  IF R1$ =  MID$ (S$,J * 3 + 2,3) THEN W1 = 1:J = 9
930  NEXT J: IF W1 = 1 THEN  RETURN
940  GOSUB 890: PRINT LF$;: GOSUB 1010: GOTO 900
950  GOSUB 1010: PRINT  MID$ (S$,3 * (X - 1) + 2,3); SPC( 2);F(X);
960  PRINT  SPC( 9 -  LEN ( STR$ (F(X))) -  LEN ( STR$ (T(X))));T(X);
970  FOR J = 1 TO P: PRINT  TAB( 16 + ((J - 1) * 6));M(J,X + 1);: NEXT J: PRINT
      : RETURN
980  GOSUB 1010: PRINT "CASH TOTAL =";
990  FOR J = 1 TO P: PRINT  TAB( 15 + ((J - 1) * 6));M(J,1);: NEXT J: PRINT : R
     ETURN
1000  PRINT "                                        ": RETURN : REM THIS LINE H
     AS 39 SPACES
1010  GOSUB 1000: VTAB  FN VC( - 1): RETURN : REM CURSOR UP
1020  FOR N = 1 TO P: FOR J = 1 TO 10:M(N,1) = M(N,1) + (T(J) * M(N,J + 1)): NE
     XT J: NEXT N
1030  PRINT : PRINT "NET WORTH   =";: GOSUB 990
1040  PRINT LF$;LF$;LF$;"DO YOU WANT TO PLAY AGAIN (Y OR N)   N";BS$;BS$;
1050  INPUT R$: IF R$ = "N" THEN  HOME : END
1060  IF R$ = "Y" THEN  HOME : GOTO 340
1070  VTAB 20: GOSUB 1010: GOTO 1040
1072  REM ========================
1075  REM *-*-*  GAME DATA  *-*-*
1077  REM ========================
1080 A(1,9) = 5:A(2,6) =  - 25:A(3,7) = 15:A(4,4) =  - 5:A(5,9) = 5:A(6,6) = 5:
     A(7,6) = 10:A(8,2) = 10:A(9,6) = 15:A(10,2) =  - 5
1090 A(10,2) =  - 5:A(11,1) = 8:A(11,2) = 5:A(11,3) = 5:A(11,7) = 7:A(12,8) =
     - 25:A(13,8) = 10:A(14,2) =  - 10
1095 A(15,2) = 5:A(16,1) = 10:A(17,5) = 17:A(18,5) =  - 15:A(19,8) = 10:A(20,7)
     =  - 15:A(21,7) = 10:A(22,7) =  - 15:A(23,3) =  - 8:A(23,5) = 8
1100 A(23,8) = 5:A(24,1) =  - 10:A(25,1) = 8:A(26,7) =  - 5:A(27,3) = 3:A(27,9)
      = 4:A(28,1) =  - 8:A(29,4) = 5:A(30,5) =  - 10
1110 A(31,7) = 10:A(32,1) =  - 8:A(32,2) =  - 5:A(32,7) =  - 7:A(33,1) = 10:A(3
     4,9) =  - 14:A(35,1) =  - 10:A(36,6) =  - 5
1120  RETURN
1440  DATA  -2,-10,-7,-9,-2,-9,-7,-16,-4
1450  DATA  26,16,25,8,-14,21,14,-4,17
1460  DATA  18,23,11,12,46,18,-5,34,15
1470  DATA  23,28,-2,11,56,19,30,29,14
1480  DATA  20,15,15,7,-20,15,13,-10,12
1490  DATA  17,21,13,-2,37,23,23,19,14
1500  DATA  19,29,17,9,-5,26,13,-7,15
1510  DATA  11,18,14,11,67,15,22,18,13
1520  DATA  13,31,1,14,-11,18,18,-14,10
1530  DATA  14,-8,19,-1,-9,25,-10,13,19
1540  DATA  24,24,23,20,51,27,38,33,18
1550  DATA  12,14,13,10,10,20,21,25,8
1560  DATA  7,-6,10,-10,30,6,-19,22,-2
1570  DATA  9,10,7,-5,-20,12,21,18,7
1580  DATA  7,8,5,-6,-40,3,16,-14,4
1590  DATA  8,6,4,-4,40,8,4,-12,3
1600  DATA  6,4,3,3,-15,5,8,-8,5
1610  DATA  5,7,-1,-3,45,6,-10,10,4
1620  DATA  -2,6,-3,-8,-20,7,10,14,6
1630  DATA  11,11,-5,-7,30,10,-11,-18,-4
1640  DATA  -5,13,-8,6,25,4,18,-22,-4
1650  DATA  -8,-10,-10,-15,-20,-20,-23,-25,-7
2000  REM ================
2010  REM PRINT PROSPECTUS
2020  REM ================
2030  HOME
2040  PRINT "HIB--";: INVERSE : PRINT "HIGHWAY IMPROVEMENT BONDS": NORMAL
2050  PRINT " (YIELD 5%)"
2060  PRINT " AN EXCELLENT STATE BOND WITH GOOD"
2070  PRINT " SECURITY AND INCOME POTENTIAL, BUT"
2080  PRINT " NO APPRECIATION."
2090  PRINT
2100  PRINT "XP--";: INVERSE : PRINT "X-PANDO CORPORATION": NORMAL
2110  PRINT " (YIELD 1%)"
2120  PRINT " A RAPIDLY EXPANDING INDUSTRIAL FIRM"
2130  PRINT " THAT REINVESTS MOST EARNINGS ON"
2140  PRINT " RESEARCH, CAUSING LOW YIELD.  THE"
2150  PRINT " PRICE-TO-EARNINGS RATIO IS EXTREMELY"
2160  PRINT " HIGH."
2170  PRINT
2180  PRINT "SP--";: INVERSE : PRINT "SEASIDE PROPERTIES INC.": NORMAL
2190  PRINT " (NO YIELD)"
2200  PRINT " GOOD APPRECIATION PROSPECTS BUT NO"
2210  PRINT " DIVIDENDS.  IN THE IMMEDIATE FUTURE,"
2220  PRINT " HOWEVER, THE PROPOSED BEACH CLEANUP"
2230  PRINT " PROGRAM COULD HAVE GREAT EFFECTS ON"
2240  PRINT " EARNINGS."
2250  GOSUB 4000
2260  PRINT "ODM--";: INVERSE : PRINT "OLD DOG MUTUAL FUND": NORMAL
2270  PRINT " (YIELD 4%)"
2280  PRINT " A COMMON STOCK MUTUAL FUND THAT"
2290  PRINT " REPRESENTS A GOOD, STEADY INCOME,"
2300  PRINT " WITH ONLY FAIR APPRECIATION."
2310  PRINT
2320  PRINT "RD--";: INVERSE : PRINT "RUBBLE DEVELOPMENT": NORMAL
2330  PRINT " (YIELD 7%)"
2340  PRINT " A HIGH-INCOME REAL-ESTATE INVESTMENT"
2350  PRINT " WITH STEADILY DEPRECIATING CAPITAL"
2360  PRINT " ASSETS."
2370  PRINT
2380  PRINT "SO--";: INVERSE : PRINT "SLIPPERY OIL COMPANY": NORMAL
2390  PRINT " (NO YIELD)"
2400  PRINT " VERY SPECULATIVE INVESTMENT SINCE"
2410  PRINT " PROFITS GO TOWARD NEW OIL WELLS."
2420  PRINT " NO DIVIDENDS ARE EXPECTED."
2430  PRINT
2440  GOSUB 4000
2450  PRINT "BT--";: INVERSE : PRINT "BUMPY TRANSPORT COMPANY": NORMAL
2460  PRINT " (NO YIELD)"
2470  PRINT " HIGH APPRECIATION INVESTMENT WITH A"
2480  PRINT " GOOD OUTLOOK, DEPENDING ON THE"
2490  PRINT " ADMINISTRATIVE ABILITY OF ITS NEW"
2500  PRINT " BOARD OF DIRECTORS. NO DIVIDENDS"
2510  PRINT " ARE EXPECTED SINCE ALL PROFITS ARE"
2520  PRINT " RECYCLED INTO THE COMPANY."
2530  PRINT
2540  PRINT "KA--";: INVERSE : PRINT "KRASH AUTO COMPANY": NORMAL
2550  PRINT " (YIELD 2%)"
2560  PRINT " A MEDIUM-SIZE AUTO COMPANY"
2570  PRINT " REPRESENTING A SOMEWHAT HIGH PRICE-"
2580  PRINT " TO-EARNINGS RATIO WITH A LOW YIELD."
2590  GOSUB 4000
2600  PRINT "ZE--";: INVERSE : PRINT "ZAP ELECTRONICS INC.": NORMAL
2610  PRINT " (YIELD 6%)"
```

More

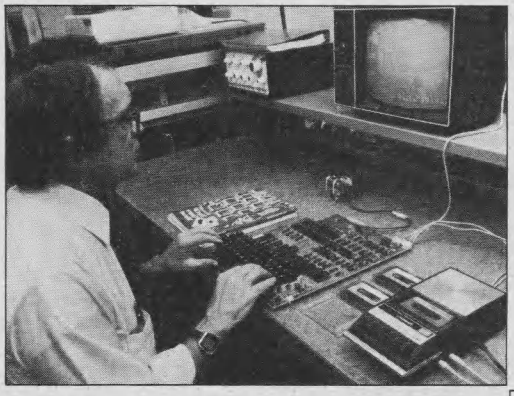
Listing continued.

```
2620  PRINT " A HIGHLY SPECULATIVE, HIGH-INCOME"
2630  PRINT " STOCK WITH A FAIR TO POOR LONG-TERM": PRINT " PROSPECT."
2640  PRINT
2650  PRINT "BPL--";: INVERSE : PRINT "BLINKEY POWER AND LIGHT": NORMAL
2660  PRINT " (YIELD 3%)"
2670  PRINT " A STEADILY GROWING UTILITY COMPANY"
2680  PRINT " IN AN ESTABLISHED INDUSTRIAL AREA."
2690  GOSUB 4000
2700  GOSUB 620: GOTO 820
3000  PRINT "THE OBJECT OF THIS GAME IS TO SHREWDLY"
3010  PRINT "INVEST $5000 IN THE GAME'S TEN"
3020  PRINT "SECURITIES, BUYING AND SELLING EACH"
3030  PRINT "YEAR IN AN ATTEMPT TO BECOME THE"
3040  PRINT "WEALTHIEST PLAYER."
3050  RETURN
3100  HOME : REM PRINT INSTRUCTIONS
3110  PRINT "EACH YEAR ALL PLAYERS RECEIVE DIVIDENDS"
3120  PRINT "ON EVERY PAYING STOCK WORTH $50 OR"
3130  PRINT "MORE.  THEN EACH PLAYER GETS A CHANCE"
3140  PRINT "TO SELL ANY STOCKS HE OWNS OR BUY ANY"
3150  PRINT "STOCKS HE WANTS.  WHEN ALL PLAYERS"
3160  PRINT "HAVE COMPLETED THEIR TRANSACTIONS,"
3170  PRINT "THE NEXT YEAR'S VALUES ARE COMPUTED"
3180  PRINT "AND THE GAME CONTINUES."
3190  PRINT
3200  PRINT "AT THE END OF TEN YEARS, EACH PLAYER'S"
3210  PRINT "NET WORTH IS CALCULATED AND THE"
3220  PRINT "WEALTHIEST PLAYER WINS!"
3230  GOSUB 4000
3240  PRINT "IF THE VALUE OF ANY STOCK FALLS TO"
3250  PRINT "ZERO, THAT STOCK GOES BANKRUPT AND ALL"
3260  PRINT "SHARES ARE SURRENDERED.  THE STOCK"
3270  PRINT "IS THEN REISSUED AT $100."
3280  PRINT
3290  PRINT "IF THE VALUE REACHES $150, THE STOCK"
3300  PRINT "SPLITS 2-FOR-1 AND ANY PLAYERS OWNING"
3310  PRINT "SHARES WILL RECEIVE THE EXTRA SHARES."
3320  PRINT "(THE VALUE OF THE STOCK IS ROUNDED"
3330  PRINT "UP TO THE NEXT HIGHER DOLLAR WHEN"
3340  PRINT "SPLIT.)"
3350  GOSUB 4000
3360  RETURN
4000  VTAB 24: PRINT "(PRESS ANY KEY TO CONTINUE.)";: GET XX$: PRINT XX$;: HOME
      : RETURN : REM WAIT FOR PLAYER TO READ SCREEN
```

```
00010 REM        **** H89 Black Friday *****
00020 REM
00030 REM      Converted from Mr. Robert W. Baker's ATARI Black Friday
00035 REM      that appeared in the September issue of MICROCOMPUTING
00040 REM      by Gary J. Stachelski
00045 REM           818  15TH  Ave.
00047 REM           Prospect Park,  Pa.  19076
00050 REM
00160 REM     ************************************************************
00180 DIM R$(20),S$(32),C$(20)
00190 PRINT "     BLACK FRIDAY STOCK MARKET GAME  "
00200 DIM A(36,10),U(11,9),E(11,9),M(4,12),I(10),T(10),F(10)
00220 S$="*HIBXP SP ODMRD SO BT KA ZE BRL*"
00222 X=RND(-1)
00230 PRINT :PRINT "      Initializing Data ... . . . .  .  .  ."
00240 FOR X=1 TO 10: READ N:NEXT X
00250 FOR N=1 TO 36:FOR J=1 TO 9: READ X:A(N,J)=X:NEXT J:NEXT N
00290 FOR R=1 TO 2:FOR N=1 TO 11:FOR J=1 TO 9:READ X
00300 IF R=1 THEN U(N,J)=X
00310 IF R=2 THEN E(N,J)=X
00320 NEXT J:NEXT N:NEXT R
00322 GOSUB 1600:GOSUB 1200
00325 REM  ===== STOCK YEILDS (DIVIDENDS)
00330 DATA 5,1,0,4,7,0,0,2,6,3
00340 RESTORE :FOR N=1 TO 10:READ X:I(N)=X:F(N)=0:T(N)=100:NEXT N
00350 FOR N=1 TO 4:FOR J=2 TO 12:M(N,J)=0:NEXT J:M(N,1)=5000:NEXT N
00360 FOR N=1 TO 36:A(N,10)=0:NEXT N:Y=0
00365 PRINT C$(6);"Number of Players (1 to 4) ";
00370 INPUT "";R$:P=VAL(R$):IF P>4 OR P<1 THEN 365
00375 W1=RND(1-(RND(1)*100))
00382 REM ============================================================
00384 REM =                      COMPUTE PRICES
00386 REM ============================================================
00387 PRINT C$(7);
00390 PRINT "     *** COMPUTING NEXT YEAR ***";C$(6)
00392 GOSUB 1850
00395 W1=0:D=INT(11*RND(1)+1)
00400 C=INT(36*RND(1)+1):IF A(C,10)=1 THEN 400
00450 FOR N=2 TO 10:IF INT(C/2)<>INT((C-1)/2) THEN 470
00460 R$="BULL":F(N)=A(C,N-1)+U(D,N-1):GOTO 480
00470 R$="BEAR":F(N)=A(C,N-1)+E(D,N-1)
00472 REM ============================================================
00475 REM =                      CHECK STOCK SPLITS
00476 REM ============================================================
00480 T(N)=T(N)+F(N):IF T(N)<150 THEN 530
00485 PRINT C$(3);CHR$(39+N);CHR$(86);
00490 Z=3*(N-1)+2:PRINT "*** ";MID$(S$,Z,3);" Stock Split ***"
00500 J=INT(T(N)/2):IF J*2=T(N) THEN T(N)=J:GOTO 520
00510 T(N)=J+1
00520 FOR J=1 TO P:M(J,N+1)=M(J,N+1)*2:NEXT J
00522 REM ============================================================
00525 REM =                      CHECK BANKRUPTCIES
00527 REM ============================================================
00530 IF T(N)>0 THEN 570
00540 T(N)=100:FOR J=1 TO P:M(J,N+1)=0:NEXT J
00550 Z=3*(N-1)+2:PRINT C$(3);CHR$(39+N);CHR$(86);
00554 PRINT "** ";MID$(S$,Z,3);" WENT BANKRUPT **"
00556 PRINT C$(3);CHR$(40+N);CHR$(86);
00560 PRINT "These stocks surrendered"
00570 NEXT N
00572 REM ============================================================
00575 REM =                      UPDATE DISPLAY
00577 REM ============================================================
00580 FOR N=1 TO P:M(N,12)=0
00590 FOR J=1 TO 10:IF T(J)>50 THEN M(N,12)=M(N,12)+(I(J)*M(N,J+1))
00600 NEXT J:M(N,1)=M(N,1)+M(N,12):NEXT N:Y=Y+1
00610 PRINT C$(11);C$(8);
00620 PRINT "    Year    ";Y;"         ";LEFT$(R$,4);"  Market  ";C$(12)
00660 FOR X=1 TO 10:GOSUB 950:NEXT X:PRINT C$(10);"Div's This Yr ";
00665 R$="     "
00670 FOR J=1 TO P:Z=7-LEN(STR$(M(J,12))):PRINT M(J,12);
00673 IF Z>=1 THEN PRINT LEFT$(R$,Z);
00675 IF J=4 THEN PRINT " "
00676 NEXT J:PRINT :GOSUB 980
00680 IF Y=11 THEN 1020
00682 REM ============================================================
00685 REM =                      PLAYER TRANSACTIONS
00687 REM ============================================================
00690 FOR N=1 TO P:PRINT C$(7);C$(6)
00710 PRINT C$(6);"Player # ";N;" (B=Buy, S=Sell, D=Done) ";
```

(continued on page 171)

Circle 229 on Reader Service card.



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(from page 97)

```
03610 H$(0) = '4' : H$(1) = '2' : H$(2) = '8' : H$(3) = '6'
03620 FOR H = 0 TO 3
03630    H2$(0) = '1' : H2$(1) = '2' : H2$(2) = '3'
03640    H1$(0) = '+X06' : H1$(1) = '+X05' : H1$(2) = '+X07'
03650    IF H = 0 AND K$(2,8) = J$(2) + '4' THEN 4110
03660    X1$ = J$(2) + H$(H)
03670    IF K$(2,6) = X1$ THEN 4090
03677       REM
03678       REM  *****  Look for UP edsies in U face
03679       REM
03680    FOR H1 = 0 TO 2
03690       IF K$(2,H(H1)) <> X1$ THEN 3770
03700       IF H <> 0 THEN 3750
03710       FOR H2  =  0 TO H1
03720          Z$ = '+' + J$(2) + '1' : GOSUB 800
03730       NEXT H2
03740       GOTO 4080
03750       Z$ = H1$(H1) : GOSUB 800
03760       GOTO 4080
03770    NEXT H1
03797       REM
03798       REM  *****  Look for UP edsies in D face
03799       REM
03800    H2(0) = 4 : H2(1) = 2 : H2(2) = 8 : H2(3) = 6 : H2(4) = 4
03810    H2$(0)='0': H2$(1)= '1': H2$(2)= '2': H2$(3)= '3': H2$(4)= '0'
03820    FOR H2 = 0 TO 3
03830       IF K$(5,H2(H2 + 1)) <> X1$ THEN 3870
03840       Z$ = '+' + J$(5) + H2$(H2) : GOSUB 800
03850       Z$ = '+' + J$(0) + '2' : GOSUB 800
03860       GOTO 4080
03870    NEXT H2
03897       REM
03898       REM  *****  Look for UP edsies in F, R, B, L, faces
03899       REM
03900    H1(0) = 0 : H1(1) = 1 : H1(2) = 3 : H1(3) = 4
03910    H1$(0) = '3' : H1$(1) = '2' : H1$(2) = '1' : H1$(3) = '0'
03920    H3(0) = 1 : H3(1) = 3 : H3(2) = 4 : H3(3) = 0
03930    FOR H1 = 0 TO 3
03940       FOR H2 = 0 TO 3
03950          IF K$(H1(H1),H2(H2)) <> X1$ THEN 4060
03960          IF H2 = 1 THEN 3980
03970          Z$ = '-' + J$(2) + H2$(H1) : GOSUB 800
03980          Z$ = '+' + J$(H1(H1)) + H2$(H2) : GOSUB 800
03990          IF H2 <> 1 THEN 4020
04000          Z$ = '-' + J$(2) + H2$(H1+1) : GOSUB 800
04010          GOTO 4030
04020          Z$ = '-' + J$(2) + '1' : GOSUB 800
04030          Z$ = '+' + J$(H3(H1)) + '1' : GOSUB 800
04040          Z$ = '+' + J$(2) + H2$(H1+1) : GOSUB 800
04050          GOTO 4080
04060       NEXT H2
04070    NEXT H1
04080    GOSUB 600
04090    IF H = 3 THEN 4110
04100    Z$ = '+' + J$(2) + '1' : GOSUB 800
04110 NEXT H
04197       REM
04198       REM  *****  Position UP corners - U1, U3, U5, U7
04199       REM
04200 H$(0) = '1' : H$(1) = '3' : H$(2) = '5' : H$(3) = '7'
04210 H(0) = 1 : H(1) = 3 : H(2) = 5 : H(3) = 7
04220 H1$(0) = '2' : H1$(1) = '1' : H1$(2) = '0' : H1$(3) = '3'
04230 H2$(0) = '2' : H2$(1) = '3' : H2$(2) = '0' : H2$(3) = '1'
04240 H4$(0,0) = '0' : H4$(0,1) = '1' : H4$(0,2) = '2' : H4$(0,3) = '3'
04250 H4$(1,0) = '3' : H4$(1,1) = '0' : H4$(1,2) = '1' : H4$(1,3) = '2'
04260 H4$(2,0) = '2' : H4$(2,1) = '3' : H4$(2,2) = '0' : H4$(2,3) = '1'
04270 H4$(3,0) = '1' : H4$(3,1) = '2' : H4$(3,2) = '3' : H4$(3,3) = '0'
04280 FOR H = 0 TO 3
04290    X1$ = J$(2) + H$(H)
04300    FOR H1 = 0 TO 3
04310       IF K$(2,H(H1)) <> X1$ THEN 4400
04320       IF H1 = H THEN 5200
04330       Z$ = '+' +J$(2) + H1$(H1) : GOSUB 800
04340       Z$ = '-X11' : GOSUB 800
04350       Z$ = '+' + J$(2) + H4$(H,H1) : GOSUB 800
04360       Z$ = '+X11' : GOSUB 800
04370       IF H = 2 THEN 4390
04380       Z$ = '+' + J$(2) + H2$(H) : GOSUB 800
04390       GOTO 5020
04400    NEXT H1
04497       REM
04498       REM  *****  Look for UP corners in F,R,B,L, faces - pos 1,3
04499       REM
04500    H3(0) = 0 : H3(1) = 1 : H3(2) = 3 : H3(3) = 4 : H3(4) = 0
04510    FOR H1 = 0 TO 3
04520       IF K$(H3(H1),3) <> J$(2) + H$(H) THEN 4530
04525       IF K$(H3(H1+1),1) <> J$(2) + H$(H) THEN 4570
04520       IF K$(H3(H1),3) = J$(2) THEN 4530
04527       REM
04528       REM  *****  If found, put it in D face
04529       REM
04530       Z$ = '+' +J$(H3(H1)) + '1' : GOSUB 800
04540       Z$ = '+' + J$(5) + '1' : GOSUB 800
04550       Z$ = '+' + J$(H3(H1)) + '3' : GOSUB 800
04560       GOTO 4600
04570    NEXT H1
04597       REM
04598       REM  *****  Look for UP corners in F,R,B,L, faces - pos. 5
04599       REM
04600    H5$(0) = '2' : H5$(1) = '1' : H5$(2) = '0' : H5$(3) = '3'
04610    H3$(1) = '3' : H3$(2) = '2' : H3$(3) = '1'
04620    FOR H1 = 0 TO 3
04630       IF K$(H3(H1),5) <> X1$ THEN 4700
04640       IF H1 = 0 THEN 4660
04650       Z$ = '+' + J$(5) + H3$(H1) : GOSUB 800
04660       Z$ = '+' + J$(2) + H5$(H) : GOSUB 800
04670       Z$ = '+X11' : GOSUB 800
04680       Z$ = '-' + J$(2) + H5$(H) : GOSUB 800
04690       GOTO 5020
04700    NEXT H1
04797       REM
04798       REM  *****  Look for UP corners in F,R,B,L faces - pos. 7
04799       REM
04800    FOR H1 = 0 TO 3
04810       IF K$(H3(H1 + 1),7) <> X1$ THEN 4880
04820       IF H1 = 0 THEN 4840
04830       Z$ = '+' + J$(5) + H3$(H1) : GOSUB 800
04840       Z$ = '+' + J$(2) + H5$(H) : GOSUB 800
04850       Z$ = '+X12' : GOSUB 800
04860       Z$ = '-' + J$(2) + H5$(H) : GOSUB 800
04870       GOTO 5020
04880    NEXT H1
04897       REM
04898       REM  *****  Look for UP corners in D face
04899       REM
04900    H2(0) = 3 : H2(1) = 5 : H2(2) = 7 : H2(3) = 1
04910    FOR H1 = 0 TO 3
04920       IF K$(5,H2(H1)) <> X1$ THEN 5000
04930       IF H1 = 0 THEN 4950
04940       Z$ = '+' + J$(5) + H3$(H1) : GOSUB 800
04950       Z$ = '+' + J$(2) + H5$(H) : GOSUB 800
04960       Z$ = '+X13' : GOSUB 800
04970       Z$ = '-' + J$(5) + H3$(H1) : GOSUB 800
04980       Z$ = '-' + J$(2) + H5$(H) : GOSUB 800
04990       GOTO 5020
05000    NEXT H1
05010    GOTO 5030
05020    GOSUB 600
05030 NEXT H
05097       REM
05098       REM  *****  Reposition edsies in horizontal mid-band
05099       REM
05100 H(0) = 4 : H(1) = 4 : H(2) = 8 : H(3) = 8
05110 H1(0) = 4 : H1(1) = 8 : H1(2) = 8 : H1(3) = 4
05120 H$(0) = '4' : H$(1) = '4' : H$(2) = '8' : H$(3) = '8'
05130 H2(0) = 1 : H2(1) = 3 : H2(2) = 4
05140 H2$(0) = '1' : H2$(1) = '2' : H2$(2) = '3'
05150 H1$(0) = 'X16' : H1$(1) = 'X17' : H1$(2) = 'X17' : H1$(3) = 'X16'
05160 H1$(4) = 'X16' : H1$(5) = 'X17' : H1$(6) = 'X17'
05170 FOR H = 0 TO 1
05180    FOR H4 = 0 TO 3
05190       FOR H1 = 0 TO 3
05200          X1$ = LEFT$(K$(0,0),1) + H$(H1)
05210          IF K$(0,H(H1)) = X1$ THEN 5310
05220          FOR H2 = 0 TO 2
05230             IF K$(H2(H2),H1(H1)) <> X1$ THEN 5300
05240             Z$ = '+H'+H2$(H2) : GOSUB 800
05250             Z$ = '-' + H1$(H1) : GOSUB 800
05260             Z$ = '-H'+H2$(H2) : GOSUB 800
05270             Z$ = '+' + H1$(H1+3) : GOSUB 800
05280             GOSUB 600
05290             GOTO 5310
05300          NEXT H2
05310       NEXT H1
05320       Z$ = '+H1' : GOSUB 800
05330    NEXT H4
05340 NEXT H
05397       REM
05398       REM  *****  Look for mid-band edsies in F,R,B,L faces-pos 6
05399       REM
05400 H1(0) = 0 : H1(1) = 1 : H1(2) = 3 : H1(3) = 4
05410 H$(0) = '4' : H$(1) = '8'
05420 H1$(0) = '0' : H1$(1) = '3' : H1$(2) = '2' : H1$(3) = '1'
05430 H2(0) = 2 : H2(1) = 4 : H2(2) = 6 : H2(3) = 8
05440 H2$(0) = '+X16' : H2$(1) = '+X17'
05450 FOR H4 = 0 TO 3
05460    FOR H = 0 TO 1
05470       X1$ = LEFT$(K$(0,0),1) + H$(H)
05480       FOR H1 = 0 TO 3
05490          IF K$(H1(H1),6) <> X1$ THEN 5530
05500          Z$ = '+' + LEFT$(K$(5,0),1) + H1$(H1) : GOSUB 800
05510          Z$ = H2$(H) : GOSUB 800
05520          GOSUB 600
05530       NEXT H1
05540    NEXT H
05550    Z$ = '+H1' : GOSUB 800
05560 NEXT H4
05597       REM
05598       REM  *****  Position D face corners
05599       REM
05600 X1$ = LEFT$(K$(5,0),1)
05610 H1$(0) = '3' : H1$(1) = '5' : H1$(2) = '7' : H1$(3) = '1
05620 H1$(4) = '3' : H1$(5) = '5' : H1$(6) = '7'
05630 FOR H = 0 TO 3
05640    H1 = H
05650    X2$ = X1$ + H1$(H)
05660    IF K$(5,3) = X2$ THEN 5690
05670    IF K$(0,5) = X2$ OR K$(1,7) = X2$ THEN 5690
05680 NEXT H
05690 X2$ = X1$ + H1$(H1+1)
05700 IF K$(5,5) = X2$ THEN 5720
05710 IF K$(1,5) <> X2$ AND K$(3,7) <> X2$ THEN 5750
05720 X2$ = X1$ + H1$(H1+2)
05730 IF K$(5,7) = X2$ THEN 5980
05740 IF K$(3,5) = X2$ OR K$(4,7) = X2$ THEN 5980
05750 FOR H = H1 TO H1 + 3
05760    H2 = H
05770    X2$ = X1$ + H1$(H+1)
05780    IF K$(5,5) = X2$ THEN 5800
05790    IF K$(1,5) <> X2$ AND K$(3,7) <> X2$ THEN 5820
05800    Z$ = '-' + X1$ + '1' : GOSUB 800
05810 NEXT H
05820 IF H2 > 3 THEN H2 = H2-4
05830 X2$ = X1$ + H1$(H2+3)
05840 IF K$(5,1) = X2$ THEN 5860
05850 IF K$(4,5) <> X2$ AND K$(0,7) <> X2$ THEN 5880
05860 Z$ = '+X21' : GOSUB 800
05870 GOTO 5980
05880 X2$ = X1$ + H1$(H2+2)
05890 IF K$(5,1) = X2$ THEN 5910
05900 IF K$(4,5) <> X2$ AND K$(0,7) <> X2$ THEN 5930
05910 Z$ = '+X30' : GOSUB 800
05920 GOTO 5980
05930 IF K$(5,5) = X2$ THEN 5950
05940 IF K$(1,5) <> X2$ AND K$(3,7) <> X2$ THEN 5970
05950 Z$ = '-X30' : GOSUB 800
05960 GOTO 5980
05970 Z$ = '+X22' : GOSUB 800
05980 X2$ = X1$ + '3'
05990 FOR H = 0 TO 3
06000    IF K$(5,3) = X2$ THEN 6040
06010    IF K$(0,5) = X2$ OR K$(1,7) = X2$ THEN 6040
06020    Z$ = '+' + X1$ + '1' : GOSUB 800
06030 NEXT H
06040 GOSUB 600
06097       REM
06098       REM  *****  'Twirl' D face corners
06099       REM
06100 H(0) = 1 : H(1) = 3 : H(2) = 5
06110 H1(0) = 3 : H1(1) = 4 : H1(2) = 0
06120 H$(0) = '+X24' : H$(1) = '+X25' : H$(2) = '+X23'
06130 FOR H4 = 0 TO 1
06140    FOR H = 0 TO 3
06150       IF LEFT$(K$(5,7),1) = X1$ THEN 6240
06160       IF LEFT$(K$(3,5),1) <> X1$ THEN 6240
06170       FOR H1 = 0 TO 2
06180          IF LEFT$(K$(5,H(H1)),1) = X1$ THEN 6230
```

More

Listing continued.

```
06190          IF LEFT$(K$(H1(H1),7),1) <> X1$ THEN 6230
06200          Z$ = H$(H1) : GOSUB 800
06210          GOSUB 600
06220          GOTO 6280
06230       NEXT H1
06240       Z$ = "+" + X1$ + "1" : GOSUB 800
06250    NEXT H
06260    GOSUB 6500
06270    IF H0 = 1 THEN 6600
06280 NEXT H4
06290 FOR H = 0 TO 3
06300    IF LEFT$(K$(5,7),1) = X1$ THEN 6380
06310    FOR H1 = 0 TO 2
06320       IF LEFT$(K$(5,H(H1)),1) = X1$ THEN 6370
06340       Z$ = H$(H1) : GOSUB 800
06350       GOSUB 600
06360       GOTO 6100
06370    NEXT H1
06380    Z$ = "+" + X1$ + "1" : GOSUB 800
06390 NEXT H
06400 GOSUB 6500
06410 IF H0 = 1 THEN 6600
06420 GOTO 6100
06497       REM
06498       REM  *****  Test for D face corners all OK
06499       REM
06500 H0 = 0
06510 IF LEFT$(K$(5,1),1) <> X1$ THEN 6560
06520 IF LEFT$(K$(5,3),1) <> X1$ THEN 6560
06530 IF LEFT$(K$(5,5),1) <> X1$ THEN 6560
06540 IF LEFT$(K$(5,7),1) <> X1$ THEN 6560
06550 H0 = 1
06560 RETURN
06597       REM
06598       REM  *****  Restore D face orientation
06599       REM
06600 FOR H = 0 TO 3
06610    IF K$(5,1) = X1$ + "1" THEN 6640
06620    Z$ = "+" + X1$ + "1" : GOSUB 800
06630 NEXT H
06640 GOSUB 600
06697       REM
06698       REM  *****  Position D face edgies
06699       REM
06700 H$(0) = "8" : H$(1) = "2" : H$(2) = "4" : H$(3) = "6"
06710 H(0) = 4 : H(1) = 0 : H(2) = 1 : H(3) = 3
06720 H1(0) = 8 : H1(1) = 2 : H1(2) = 4 : H1(3) = 6
06730 H1$(0)= "+X26": H1$(1) = "-X26": H1$(2) = "+X31": H1$(3) = "+X32"
06740 DATA 0,3,1,2,  0,2,3,1,  2,3,0,1,  1,0,3,2
06750 DATA 1,0,2,3,  1,3,0,2,  3,0,1,2,  2,1,0,3
06760 DATA 2,1,3,0,  2,0,1,3,  0,1,2,3,  3,2,1,0
06770 DATA 3,2,0,1,  3,1,2,0,  1,2,3,0,  0,3,2,1
06780 FOR A = 0 TO 3 : FOR B = 0 TO 3 : FOR C = 0 TO 3
06790    READ A(A,B,C)
06800 NEXT C : NEXT B : NEXT A
06810 RESTORE
06820 FOR H = 0 TO 3
06830    FOR H1 = 0 TO 3
06840       FOR H2 = 0 TO 3
06850          IF K$(5,H1(H2)) = J$(5) + H$(A(H,H1,H2)) THEN 6870
06860          IF K$(5,H1(H2)) <> J$(H(A(H,H1,H2))) + "6" THEN 6910
06870       NEXT H2
06880       Z$ = H1$(H1) : GOSUB 800
06890       GOSUB 600
06900       GOTO 7000
06910    NEXT H1
06920    Z$ = "+X01" : GOSUB 800
06930 NEXT H
06997       REM
06998       REM  *****  'Flip' D face edgies
06999       REM
07000 H1(0) = 6 : H1(1) = 4 : H1(2) = 2 : H1(3) = 8
07010 H$(1) = "+X27" : H$(2) = "+X29" : H$(3) = "+X28"
07020 FOR H = 0 TO 2
07030    IF LEFT$(K$(5,H1(0)),1) = X1$ THEN 7090
07040    FOR H2 = 1 TO 3
07050       IF LEFT$(K$(5,H1(H2)),1) = X1$ THEN 7080
07060       Z$ = H$(H2) : GOSUB 800
07070       GOTO 7090
07080    NEXT H2
07090    Z$ = "+X01" : GOSUB 800
07100 NEXT H
07107       REM
07108       REM  *****  Re-orient cube to orisinal position
07109       REM
07110 FOR H = 0 TO 3
07120    IF RIGHT$(K$(5,3),1) = "3" THEN 7150
07130    Z$ = "+X01" : GOSUB 800
07140 NEXT H
07150 GOSUB 600
07197       REM
07198       REM  *****  Test for cube all OK
07199       REM
07200 FOR H = 0 TO 5
07210    FOR H1 = 1 TO 8
07220       IF K$(H,H1) <> J$(H) + M$(H1) THEN 7250
07230 NEXT H1 : NEXT H
07240 GOTO 7270
07250 PRINT  :  PRINT "Whoops, I better fix this !"
07260 GOTO 3320
07270 GOSUB 7800
07280 END
07297       REM
07298       REM  *****  Enter Ur codes for perfect cube
07299       REM
07300 X1$(0) = "FRONT" : X1$(1) = "RIGHT" : X1$(2) = "UP"
07310 X1$(3) = "BACK" : X1$(4) = "LEFT" : X1$(5) = "DOWN"
07320 FOR N = 0 TO 5
07330    PRINT "Enter a Color Code for the "; X1$(N); " Face ";
07340    INPUT "> "; F$
07350    IF N = 0 THEN 7410
07360    FOR N1 = 0 TO N-1
07370       IF J$(N1) <> LEFT$(F$,1) THEN 7400
07380       PRINT LEFT$(F$,1); " is assigned to the "; X1$(N1); " face"
07390       GOTO 7330
07400    NEXT N1
07410    J$(N) = LEFT$(F$,1) : X$(N) = J$(N)
07420 NEXT N
07430 RETURN
07497       REM
07498       REM  *****  Get a saved cube
07499       REM
07500 INPUT "Enter the name of the stored configuration > "; F$
```

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Listing continued.

```
07510 OPEN F$+".DAT" FOR READ AS FILE #1
07520 FOR N = 0 TO 5
07530    INPUT #1,; J$(N)
07540    FOR M = 0 TO 8
07550       INPUT #1,; K$(N,M)
07560    NEXT M
07570    X$(N) = LEFT$(K$(N,0),1)
07580 NEXT N
07590 CLOSE #1
07600 RETURN
07697       REM
07698       REM  *****  Save a cube
07699       REM
07700 INPUT "Enter Ur name for the configuration, to store it > "; F$
07710 OPEN F$+".DAT" FOR WRITE AS FILE #1
07720 FOR N = 0 TO 5
07730    PRINT #1,J$(N)
07740    FOR M = 0 TO 8
07750       PRINT #1,K$(N,M)
07760    NEXT M
07770 NEXT N
07780 CLOSE #1
07790 STOP
07797       REM
07798       REM  *****  Display number of moves
07799       REM
07800 PRINT
07810 PRINT MO; " moves performed since start of program"
07820 PRINT
07830 RETURN
07997       REM
07998       REM  *****  Enter Ur own configuration  *****
07999       REM
08000 X1$(0) = "FRONT" : X1$(1) = "RIGHT" : X1$(2) = "UP   "
08010 X1$(3) = "BACK " : X1$(4) = "LEFT " : X1$(5) = "DOWN "
08015 PRINT
08020 PRINT "Enter single letter codes for each square on each face,"
08030 PRINT "  The codes for each face should be a continuous string -"
08040 PRINT "   in the order 012345678, per standard numbering"
08045 PRINT "It takes almost 3 min. to check input, so get it right !"
08048 PRINT
08050 FOR N = 0 TO 5
08060    PRINT "Enter color codes for the "; X1$(N);
08070    INPUT " Face > "; X1$
08080    IF LEN(X1$) = 9 THEN 8100
08090    PRINT "Sumthin's wrong !" : GOTO 8060
08097       REM
08098       REM  *****  Test for duplicate face codes  *****
08099       REM
08100    IF N = 0 THEN 8160
08110    FOR N1 = 0 TO N-1
08120       IF J$(N1) <> LEFT$(X1$,1) THEN 8150
08130       PRINT LEFT$(X1$,1)" is assigned to the "; X1$(N1); " face"
08140       GOTO 8060
08150    NEXT N1
08160    J$(N) = LEFT$(X1$,1) : K$(N,0) = J$(N) + ")" : X$(N) = J$(N)
08170    FOR M = 1 TO 8 : K$(N,M) = MID$(X1$,M+1,1) : NEXT M
08180 NEXT N
08197       REM
08198       REM  *****  Skip previous DATA
08199       REM
08200 FOR A = 0 TO 3 : FOR B = 0 TO 3 : FOR C = 0 TO 3
08210   READ A(A,B,C)
08220 NEXT C : NEXT B : NEXT A
08247       REM
08248       REM  *****  Corner code tables  *****
08249       REM
08250 DIM L(15,1), L1(5,3), K1(5,3), K2(5,3), K3(7,2), K4(7,2)
08260 DIM K5(11,1), K6(11,1), L2(5,3)
08270 DATA 2,4,10,1,2,1,5,1,5,4,5,6,2,0,7,3,2,0,5,3,8,0,5,7
08280 DATA 3,4,3,1,3,3,0,1,3,4,0,3,2,1,13,4,2,12,5,4,15,1,5,14
08290 DATA 2,3,0,0,2,2,5,0,2,3,5,8,0,4,11,1,0,11,3,1,11,4,3,11
08300 DATA 0,1,2,7,4,3,0,3,1,1,2,5,0,5,5,3,1,7,0,7,4,5,5,1
08310 DATA 3,1,2,3,1,3,3,3,4,1,2,1,3,5,5,7,4,7,3,7,1,5,5,5
08320 DATA 1,3,1,5,1,7,3,1,3,5,3,7,5,1,5,3
08325 DATA 5,7,7,1,7,3,7,5,1,1,3,3,5,5,7,7
08330 FOR N = 0 TO 5
08340    FOR M = 0 TO 3 : READ K1(N,M),K2(N,M),L1(N,M) : NEXT M
08350 NEXT N
08360 FOR N = 0 TO 7
08370    FOR M = 0 TO 2 : READ K3(N,M), K4(N,M) : NEXT M
08380 NEXT N
08390 FOR N = 0 TO 15 : READ L(N,0),L(N,1) : NEXT N
08397       REM
08398       REM  *****  Edge code tables  *****
08399       REM
08400 DATA 0,2,2,6,0,4,1,8,0,6,5,2,0,8,4,4,3,2,2,2,3,4,4,8
08410 DATA 3,6,5,6,3,8,1,4,1,2,2,4,1,6,5,4,4,2,2,8,4,6,5,8
08420 DATA 6,8,2,4,4,8,4,4,2,2,2,2,2,8,6,4,8,8,8,4,6,6,6,6
08430 FOR N = 0 TO 11
08440    FOR M = 0 TO 1 : READ K5(N,M), K6(N,M) : NEXT M
08450 NEXT N
08460 FOR N = 0 TO 5 : FOR M = 0 TO 3 : READ L2(N,M) : NEXT M : NEXT N
08497       REM
08498       REM  *****  Test validity of corner inputs  *****
08499       REM
08500 FOR C = 0 TO 7
08510    FOR N = 0 TO 5
08520       IF K$(K3(C,0),K4(C,0)) <> J$(N) THEN 8610
08530       FOR M = 0 TO 3
08540          IF K$(K3(C,1),K4(C,1)) <> J$(K1(N,M)) THEN 8600
08550          IF K$(K3(C,2),K4(C,2)) <> J$(K2(N,M)) THEN 8620
08557             REM
08558             REM  *****  Load corner position numbers
08559             REM
08560          K$(K3(C,0),K4(C,0)) = K$(K3(C,0),K4(C,0)) + M$(M*2+1)
08570          K$(K3(C,1),K4(C,1))=K$(K3(C,1),K4(C,1))+M$(L(L1(N,M),0))
08580          K$(K3(C,2),K4(C,2))=K$(K3(C,2),K4(C,2))+M$(L(L1(N,M),1))
08590          GOTO 8670
08600       NEXT M
08610    NEXT N
08617       REM
08618       REM  *****  Re-enter invalid corner code  *****
08619       REM
08620    FOR C1 = 0 TO 2
08630     PRINT"Please re-enter ";X1$(K3(C,C1));" face corner ";K4(C,C1);
08640       INPUT " > "; K$(K3(C,C1),K4(C,C1))
08650    NEXT C1
08660    GOTO 9200
08670 NEXT C
08697       REM
08698       REM  *****  Test validity of edge inputs  *****
08699       REM
08700 FOR C = 0 TO 11
08710    FOR N = 0 TO 5
08720    IF K$(K5(C,0),K6(C,0)) <> J$(N) THEN 8790
08730    FOR M = 0 TO 3
08740       IF K$(K5(C,1),K6(C,1)) <> J$(K1(N,M)) THEN 8780
08747       REM
08748       REM  *****  Load edge position numbers
08749       REM
08750       K$(K5(C,0),K6(C,0)) = K$(K5(C,0),K6(C,0)) + M$(M*2+2)
08760       K$(K5(C,1),K6(C,1)) = K$(K5(C,1),K6(C,1))+M$(L2(N,M))
08770       GOTO 8850
08780    NEXT M
08790 NEXT N
08797       REM
08798       REM  *****  Re-enter invalid edges  *****
08799       REM
08800    FOR C1 = 0 TO 1
08810     PRINT"Please re-enter ";X1$(K5(C,C1));" face edge ";K6(C,C1);
08820       INPUT " > "; K$(K5(C,C1),K6(C,C1))
08830    NEXT C1
08840    GOTO 9200
08850 NEXT C
08897       REM
08898       REM  *****  Test for duplicate inputs
08899       REM
08900 D = 0 : FOR N = 0 TO 5
08910    FOR M = 1 TO 7
08920       FOR M1 = M+1 TO 8
08930          IF K$(N,M) <> K$(N,M1) THEN 8990
08940          PRINT "Please re-enter "; X1$(N);" face position "; M;
08950          INPUT " > "; K$(N,M)
08960          PRINT "Please re-enter "; X1$(N);" face position "; M1;
08970          INPUT " > "; K$(N,M1)
08980          D = 1
08990       NEXT M1
09000    NEXT M
09010 NEXT N
09020 FOR N = 0 TO 4
09030    FOR N1 = N+1 TO 5
09040       FOR M = 1 TO 8
09050          FOR M1 = 1 TO 8
09060             IF K$(N,M) <> K$(N1,M1) THEN 9120
09070             PRINT "Please re-enter ";X1$(N);" face position "; M;
09080             INPUT " > "; K$(N,M)
09090             PRINT"Please re-enter ";X1$(N1);" face position ";M1;
09100             INPUT " > "; K$(N1,M1)
09110             D = 1
09120          NEXT M1
09130       NEXT M
09140    NEXT N1
09150 NEXT N
09160 IF D = 0 THEN 9300
09197       REM
09198       REM  *****  Reset corner and edge input position numbers
09199       REM
09200 FOR N = 0 TO 5
09210   FOR M = 1 TO 8 : K$(N,M) = LEFT$(K$(N,M),1) : NEXT M
09220 NEXT N
09230 GOTO 8500
09300 CLEAR L( : CLEAR L1( : CLEAR K2( : CLEAR K3( : CLEAR K4(
09310 CLEAR K1( : CLEAR K5( : CLEAR K6(
09360 RETURN
```

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MEM-65256A *256K A & T* **$774.95**
SFC-55009000F *RAMDISK sftwr CP/M 2.2* **$44.95**
SFC-55009000F *RAMDISK with EXRAM III* **$24.95**

128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A *A & T* **$1609.95**
MEM-12810C *CSC* **$1794.95**

64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A *64K A & T* **$549.95**
MEM-64180C *64K CSC* **$698.95**

64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A *RAM 16 A & T* **$598.95**
MEM-32180C *RAM 16 CSC* **$698.95**

64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A *A & T* **$499.95**

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A *64K A & T* **$499.95**

64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma.

MEM-99152B *Bare board* **$49.95**
MEM-99152K *Kit less RAM* **$99.95**
MEM-32152K *32K kit* **$199.95**
MEM-56152K *56K kit* **$289.95**
MEM-64152K *64K kit* **$299.95**
Assembled & Tested ..... **add $50.00**

2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemeco Cromix & Alpha Micro.

MEM-64566A *64K A & T* **$424.95**

64K EXPANDORAM II - SD Systems

Expandable RAM board from 16K to 64K using 4116 RAM chips.

MEM-16630A *16K A & T* **$344.95**
MEM-32631A *32K A & T* **$364.95**
MEM-48632A *48K A & T* **$384.95**
MEM-64633A *64K A & T* **$399.95**

MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B *Bare board w/manual* **$49.95**
MEM-99730K *Kit with no RAM* **$179.95**
MEM-32731K *32K kit* **$199.95**
MEM-64733K *64K kit* **$249.95**
Assembled & Tested ..... **add $50.00**

16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A *16K A & T* **$149.95**

S-100 I/O Boards

SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A *SS1 A & T* **$359.95**
IOX-1850C *SS1 CSC* **$459.95**
IOX-1855A *with 9511 A & T* **$554.95**
IOX-1855C *with 9511 CSC* **$654.95**
IOX-1860A *with 9512 A & T* **$554.95**
IOX-1860C *with 9512 CSC* **$654.95**

INTERFACER 1 - CompuPro

2 serial I/O ports 50-19.2K baud.

IOI-1810A *A & T* **$218.95**
IOI-1810C *CSC* **$288.95**

INTERFACER 2 - CompuPro

3 parallel, 1 serial, & interrupt timer.

IOI-1820A *A & T* **$218.95**
IOI-1820C *CSC* **$288.95**

INTERFACER 3 - CompuPro

5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.

IOI-1835A *5 port A & T* **$558.95**
IOI-1835C *5 port CSC* **$628.95**
IOI-1838A *8 port A & T* **$628.95**
IOI-1838C *8 port CSC* **$749.95**

INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel.

IOI-1840A *A & T* **$314.95**
IOI-1840C *CSC* **$414.95**

MPX - CompuPro

Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

IOI-1875A *4K MPX A & T* **$444.95**
IOI-1875C *4K MPX CSC* **$534.95**
IOI-1880A *16K MPX A & T* **$584.95**
IOI-1880C *16K MPX CSC* **$674.95**

I/O-8 - SSM Microcomputer

Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems.

IOI-1018A *A & T* **$469.95**

I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud

IOI-1015A *A & T* **$289.95**

MPC-4 - SD Systems

Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system.

IOI-1504A *A & T w/software* **$495.00**

I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports.

IOI-1010B *Bare board w/manual* **$35.00**
IOI-1010K *Kit with manual* **$179.95**
IOI-1010A *A & T with manual* **$249.95**

2830 6 PORT SERIAL - C.C.S.

Six asynchronous RS-232C serial I/O ports with programmable baud rates.

IOI-1040A *A & T with manual* **$529.95**

2710 4 PORT SERIAL - C.C.S.

Four RS-232C serial I/O ports with full handshaking.

IOI-1060A *A & T with manual* **$319.95**

2719 2 SER & 2 PAR - C.C.S.

Two RS-232C serial I/O ports plus two 8 bit parallel I/O ports.

IOI-1080A *A & T with manual* **$349.95**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

Circle 48 on Reader Service card.

Disk Drive for Apple $289.95

Modems

SIGNALMAN - Anchor
Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A *Signalman* **$89.95**

SMARTMODEM - Hayes
Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A *Smartmodem* **$224.95**
IOK-1500A *Hayes Chronograph* **$218.95**
IOM-2010A *Micromodem II* **$328.95**
IOM-2012A *Terminal program for MMII* **$89.95**
IOM-1100A *Micromodem 100* **$368.95**

APPLE-CAT - Novation
Software selectable 1200 or 300 Baud, direct connect, auto-answer/auto-dial,touch & pulse dialing, auxiliary 3-wire RS-232C serial port for printer

IOM-5232A *Save $50.00* **$324.95**

1200 BAUD SMARTMODEM - Hayes
1200 and 300 baud, all the features of the standard Smartmodem plus 1200 baud, 212 compatible, full or half duplex.

IOM-5500A *Smartmodem 1200* **$599.95**

1200 BAUD AUTO CAT - Novation
212 Auto Cat, 1200 & 300 baud, auto dial/answer/disconnect, LED readout displays mode, analog/digital loop-back self tests, usable with multi-line phones.

IOM-5231A *212 Auto Cat* **$649.95**

Video Monitors

HI-RES 12" GREEN - Zenith
15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201 *List price $189.95* **$129.95**

12" GREEN SCREEN - NEC
20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor with audio.

VDM-651200 *Deluxe model* **$199.95**
VDM-651260 *Economy model* **$149.95**

12" COLOR MONITOR - NEC
High resolution color monitor with audio.

VDC-651212 *Color monitor* **$389.95**
NEC-1202D *RGB color monitor* **$999.95**

13" COLOR MONITORS - BMC
18 MHz RGB & composite video color monitors.

VDC-421320 *13" RGB Color* **$369.95**
VDC-421310 *13" Composite video* **$329.95**
VDX-420090 *RGB card for Apple* **$149.95**

COLOR MONITORS - Amdek
Reasonably priced color video monitors.

VDC-80130 *13" Color I* **$379.95**
VDC-801320 *13" Color II* **$894.95**
IOV-2300A *DVM board for Apple* **$199.95**

AMBER or GREEN MONITORS - Jade
High resolution 18 MHz compact video monitors.

VDM-751210 *12" Amber phosphor* **$149.95**
VDM-751220 *12" Green phosphor* **$139.95**
VDM-750910 *9" Amber phosphor* **$149.95**
VDM-750920 *9" Green phosphor* **$139.95**

EPROM Erasers

ULTRA-VIOLET EPROM ERASERS
Inexpensive erasers for industry or home.

XME-3100A *Spectronics w/o timer* **$69.50**
XME-3101A *Spectronics with timer* **$94.50**
XME-3200A *Economy model* **$39.95**

Single User System

THREE BOARD SET - SD Systems
4 MHz Z-80A CPU, 64K RAM (optional 256K), serial I/O port, parallel I/O port, double density disk controller, CP/M 2.2 & manual set, system monitor, control & diagnostic software. Includes SBC-200, 64K ExpandoRAM II, Versafloppy II, & CP/M 2.2 - all boards are assembled & tested.

Board set with 64K of RAM **$1095.00**
Board set with 256K of RAM **$1295.00**

Apple II Accessories

APPLE DISK DRIVE - Fourth Dimension
Totally Apple compatible, 143,360 bytes per drive on DOS 3.3, half-track capability - reads all Apple software, plugs right in to Apple controller as second drive, DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

MSM-123200 *40 Track add on Apple drive* **$289.95**
MSM-123200 *Controller with free DOS 3.3* **$99.95**

16K RAM CARD - for Apple II
Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?

MEX-16700A *Save over $100.00* **$69.95**

Z-80 CPU CARD - for Apple II
Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M and complete manual set.

CPX-62800A *A & T with software* **$249.95**

APPLE-CAT - Novation
Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A *Save $50.00!!!* **$325.95**

8" DISK CONTROLLER - Vista
New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible

IOD-2700A *A & T* **$499.95**

2 MEGABYTES for Apple II
Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package *Kit* **$1495.00**
1 MegaByte Package *A & T* **$1695.00**
2 MegaByte Package *Kit* **$1795.00**
2 MegaByte Package *A & T* **$1995.95**

VISION 80 - Vista Computer
80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz

IOV-2400A *Vista Vision 80* **$299.95**

CPS MULTICARD - Mtn. Computer
Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.

IOX-2300A *A & T* **$179.95**

HI-RES GRAPHICS CARD - Genie
Intelligent printer interface and control card allows full high resolution graphics and screen dumps.

IOP-2405A *Genie for Epson* **$119.95**
IOP-2410A *Genie for Okidata* **$119.95**
IOP-2415A *Genie for NEC/C. Itoh* **$119.95**

Power Strips

ISOBAR - GSC
Isolates & protects your valuable equipment from high voltage spikes & AC line noise, inductive isolated ground, 15 amp circuit breaker, U.L. listed

EME-115103 *3 socket* **$39.50**
EME-115105 *4 socket* **$49.50**
EME-115100 *8 socket* **$54.50**
EME-115110 *9 socket rackmount* **$74.50**

Single Board Computer

SUPERQUAD - Adv. Micro Digital
Single board, standard size S-100 computer system, 4 MHz Z-80A, single or double density disk controller for 5¼" or 8" drives, 64K RAM, extended addressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible.

CPC-30800A *A & T* **$724.95**
IOX-4232A *Serial I/O adapter* **$29.95**

Z-80 STARTER KIT - SD Systems
Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook.

CPS-30100K *Kit with workbook* **$299.95**
CPS-30100A *A & T with workbook* **$469.95**

AIM-65 - Rockwell International
Complete 6502 microcomputer with alphanumeric display, printer, keyboard, & instruction manual.

CPK-50165A *1K AIM-65* **$424.95**
CPK-50465A *4K AIM-65* **$474.95**
SFK-74600008E *8K Basic ROM* **$64.95**
SFK-64600004E *4K assembler ROM* **$43.95**
SFK-74600020E *PL/65 ROM* **$84.95**
SFK-74600010E *Forth ROM* **$64.95**
SFK-74600030E *Instant Pascal* **$99.95**
PSX-030A *Power supply* **$64.95**
ENX-000002 *Enclosure* **$54.95**

SPECIAL PACKAGE
4K AIM-65, 8K Basic, power supply, & enclosure

Special Package Price **$649.95**

S-100 EPROM Boards

PROM-100 - SD Systems
2708, 2716, 2732 EPROM programmer with software.

MEM-99520K *Kit with software* **$189.95**
MEM-99520A *A & T with software* **$249.95**

PB-1 - SSM Microcomputer
2708, 2716 EPROM board with on-board programmer.

MEM-99510K *Kit with manual* **$154.95**
MEM-99510A *A & T with manual* **$219.95**

EPROM BOARD - Jade
16K or 32K uses 2708 or 2716 EPROMs, 1K boundary.

MEM-16230K *Kit w/o EPROMs* **$79.95**
MEM-16230A *A & T w/o EPROMs* **$119.95**

S-100 Video Boards

SPECTRUM COLOR - CompuPro
Full-function color graphics board, up to 8 colors, 256 x 192 graphics, parallel I/O port, 8K RAM.

IOV-1870A *A & T* **$348.95**
IOV-1870C *CSC* **$398.95**

MICROANGELO - Scion
Ultra-high-resolution 512 x 480, 256 color or black & white S-100 video board

IOV-1500A *A & T* **$799.95**

S-100 MotherBoards

ISO-BUS - Jade
Silent, simple, and on sale - a better motherboard

6 Slot (5¼" x 8⅝")

MBS-061B *Bare board* **$22.95**
MBS-061K *Kit* **$39.95**
MBS-061A *A & T* **$69.95**

12 Slot (9¾" x 8⅝")

MBS-121B *Bare board* **$34.95**
MBS-121K *Kit* **$69.95**
MBS-121A *A & T* **$109.95**

18 Slot (14½" x 8⅝")

MBS-181B *Bare board* **$54.95**
MBS-181K *Kit* **$99.95**
MBS-181A *A & T* **$149.95**

ACTIVE TERMINATOR - CompuPro
A true mother's helper.

TSX-100A *A & T* **$59.45**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

8" Double-Density Disk Drive $249

Save $500.00 Dual 8" Disk Drive Sub-System Kit - $695.00 Assembled & Tested - $795.00

Printers on Sale

NEW EPSONS with GRAFTRAX-plus

MX-80FT with GRAFTRAX-plus *same as MX-80 with friction feed and pin feed.*
PRM-28082 *MX-80FT w/GRAFTRAX-plus* **$539.95**

MX-100 with GRAFTRAX-plus *132/232 column, correspondence quality, up to 15" paper, friction feed & adjustable pin feed, 18 x 18 dot matrix, 80 CPS.*
PRM-28100 *MX-100 w/GRAFTRAX-plus* **$729.95**

PRA-27084 *Serial interface* **$54.95**
PRA-27088 *Serial intf & 2K buffer* **$99.95**
PRA-27081 *Apple card* **$39.95**
PRA-27082 *Apple cable* **$19.95**
PRA-27086 *IEEE 488 card* **$59.95**
PRA-27087 *TRS-80 cable* **$24.95**
PRA-27097 *GRAFTRAX-plus 80* **$59.95**
PRA-27197 *GRAFTRAX-plus 100* **$64.95**
PRA-27090 *MX-80, FT print head* **$44.95**
PRA-27190 *MX-100 print head* **$49.95**
PRA-27083 *MX-80 ribbon cart.* **$13.95**
PRA-27101 *MX-100 ribbon only* **$9.95**

BETTER THAN EPSON ! - Okidata

Microline 82A *80/132 column,* ***120 CPS****, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking,* ***both serial & parallel interfaces included****, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics*
PRM-43082 *Friction & pin feed* **$479.95**

Microline 83A *132/232 column, 120 CPS, forms up to 15" wide, removable tractor, plus all the features of the 82A.*
PRM-43083 *with FREE tractor* **$699.95**

Microline 84 *132/232 column, Hi-speed 200 CPS, full dot graphics built in, plus all the features of the 83A.*
PRM-43084 *Centronics parallel* **$1099.95**
PRM-43085 *Serial with 2K buffer* **$1149.95**

PRA-27081 *Apple card* **$39.95**
PRA-27082 *Apple cable* **$19.95**
PRA-27087 *TRS-80 cable* **$24.95**
PRA-43081 *2K hi speed serial card* **$99.95**
PRA-43082 *Hi-res graphics ROMs 82A* **$49.95**
PRA-43083 *Hi-graphics ROMs 83A* **$49.95**
PRA-43088 *Tractor option for 82A* **$49.95**
PRA-43080 *Extra ribbons pkg. of 2* **$9.95**

8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.
NEC-8023A *8023 parallel* **$499.95**
NEC-8023-01 *8023 ribbon* **$11.95**

TP-1 LETTER QUALITY - SCM

12 CPS daisy wheel printer from Smith Corona.
PRD-45101 *Centronics parallel* **$648.95**
PRD-45102 *RS-232C serial* **$648.95**

LETTER QUALITY PRINTER - Jade

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.
PRD-11001 *Centronics parallel* **$899.95**
PRD-11002 *RS-232C serial model* **$969.95**
PRA-11000 *Tractor Option* **$169.95**

KSR DAISY WHEEL - Anderson-Jacobson

Letter quality communications terminal/printer with full typewriter keyboard, 30 CPS Diablo print mechanism, RS-232 interface, includes free printer stand with deluxe casters, print wheel, ribbon, friction feed standard (tractor feed optional), factory refurbished with 30 day warranty, shipped freight collect.
PRD-99100 *AJ KSR printer* **$995.00**
PRA-99200 *Tractor option* **$150.00**

PRINTER PALS - F.M.J. Inc.

Desk top printer stand and continuous form paper holder.
PRA-99080 *for MX-80, MX-80FT, Oki 82A, NEC* .. **$29.95**
PRA-99100 *for MX-100, Oki 83A & 84* **$34.95**
PRA-99700 *for letter quality printers* **$49.95**

5¼" Disk Drives

Tandon TM100-1 *single-sided double-density 48 TPI*
MSM-551001 ..... $219.95 ea 2 for **$199.95 ea**

Shugart SA400L *single-sided double-density 40 track*
MSM-104000 ..... $234.95 ea 2 for **$224.95 ea**

Shugart SA455 *half-size double-sided 48 TPI*
MSM-104550 ..... $349.95 ea 2 for **$329.95 ea**

Shugart SA465 *half-size doule-sided 96 TPI*
MSM-104650 ..... $399.95 ea 2 for **$379.95 ea**

Tandon TM100-2 *double-sided double-density 48 TPI*
MSM-551002 ..... $294.95 ea 2 for **$269.95 ea**

Shugart SA450 *double-sided double-density 35 track*
MSM-104500 ..... $349.95 ea 2 for **$329.95 ea**

Tandon TM100-3 *single-sided double-density 96 TPI*
MSM-551003 ..... $294.95 ea 2 for **$269.95 ea**

Tandon TM100-4 *double-sided double-density 96 TPI*
MSM-551004 ..... $394.95 ea 2 for **$374.95 ea**

MPI B-51 *single-sided double-density 40 track*
MSM-155100 ..... $234.95 ea 2 for **$224.95 ea**

MPI B-52 *double-sided double-density 40 track*
MSM-155200 ..... $344.95 ea 2 for **$334.95 ea**

MPI B-91 *single-sided double-density 77 track*
MSM-155300 ..... $369.95 ea 2 for **$359.95 ea**

MPI B-92 *double-sided double-density 77 track*
MSM-155400 ..... $469.95 ea 2 for **$459.95 ea**

5¼" Cabinets with Power Supply
END-000216 *Single cab w/power supply* **$69.95**
END-000226 *Dual cab w/power supply* **$94.95**

8" Disk Drives

Shugart SA810 *half-size single-sided double-density*
MSF-108100 ..... $424.95 ea 2 for **$394.95 ea**

Shugart SA860 *half-size double-sided double-density*
MSF-108600 ..... $574.95 ea 2 for **$549.95 ea**

Shugart SA801R *single-sided double-density*
MSF-10801R ..... $394.95 ea 2 for **$389.95 ea**

Shugart SA851R *double-sided double-density*
MSF-10851R ..... $554.95 ea 2 for **$529.95 ea**

Tandon TM848-1 *single-sided double-den thin-line*
MSF-558481 ..... $379.95 ea 2 for **$369.95 ea**

Tandon TM848-2 *double-sided double-den thin-line*
MSF-558482 ..... $494.95 ea 2 for **$484.95 ea**

Qume DT-8 *double-sided double-density*
MSF-750080 ..... $524.95 ea 2 for **$498.95 ea**

Mitsubishi M2894-63 *double-sided double-density*
MSF-289463 ..... $494.95 ea 2 for **$474.95 ea**

Siemens FDD 100-8 *single-sided double-density*
MSF-201120 ..... $274.95 ea 2 for **$249.00 ea**

Dual Disk Sub-Systems

Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

Dual 8" Sub-Assembly Cabinet
END-000420 *Bare cabinet* **$59.95**
END-000421 *Cabinet kit* **$225.00**
END-000431 *A & T* **$359.95**

8" Sub-Systems - Single Sided, Double Density
END-000423 *Kit w/2 FD100-8Ds* **$695.00**
END-000424 *A & T w/2 FD100-8Ds* **$795.00**
END-000433 *Kit w/2 SA-801Rs* **$999.95**
END-000434 *A & T w/2 SA-801Rs* **$1195.00**

8" Sub-Systems - Double Sided, Double Density
END-000426 *Kit w/2 DT-8s* **$1224.95**
END-000427 *A & T w/2 DT-8s* **$1424.95**
END-000436 *Kit w/2 SA-851Rs* **$1274.95**
END-000437 *A & T w/2 SA-851Rs* **$1474.95**

Prices may be slightly higher at our retail locations. Please contact the store in your area for exact pricing.

Circle 48 on Reader Service card.

IBM PC Accessories

512K PC/RAM STACK - Hammond

A high quality, high density memory expansion board for your PC. cool-quiet-reliable operation, full parity checking, unique stacking sockets, expandable from 256K to 512K. MDRIVE high speed RAMdisk software only $25.00 with 256K or 512K board purchase.
MEX-25600A *256K assembled & tested* **$795.00**
MEX-51200A *512K assembled & tested* **$999.95**
MEX-25600S *MDRIVE disk emulator* **$25.00**

256K PC/RAM - Hammond Engineering

* *User expandable from 64K to 256K, same high quality standards as the RAM Stack above, designed for medium memory expansion requirements.*
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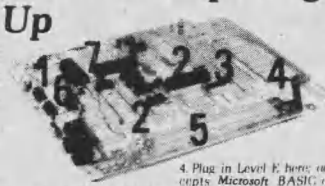

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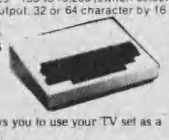

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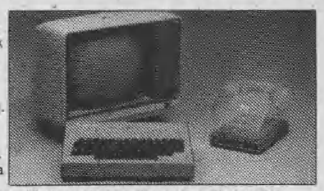

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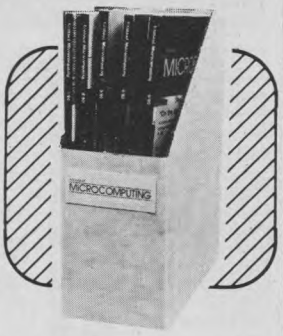

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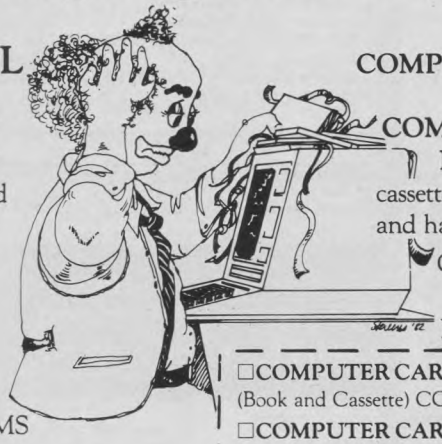

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7442	45	74154	1.00
7443	60	74157	.45
7444	60	74160	.80
7445	60	74161	.80
7447	60	74166	.90
7448	60	74174	.90
7450	18	74181	1.95
7451	18	74393	1.00
7453	19		

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74LS00	.24	74LS125	.90
74LS02	.24	74LS126	.85
74LS03	.24	74LS132	.70
74LS04	.24	74LS136	.70
74LS05	.24	74LS138	.65
74LS08	.30	74LS139	.65
74LS09	.28	74LS145	1.10
74LS10	.24	74LS151	.70
74LS11	.33	74LS153	.70
74LS12	.33	74LS157	.70
74LS15	.45	74LS158	.70
74LS14	.89	74LS161	.85
74LS20	.24	74LS162	.85
74LS21	.24	74LS163	.85
74LS26	.30	74LS164	.85
74LS27	.28	74LS165	.85
74LS28	.32	74LS169	1.55
74LS30	.24	74LS170	1.25
74LS32	.32	74LS174	.85
74LS37	.30	74LS175	.85
74LS38	.30	74LS190	.90
74LS42	.50	74LS191	.90
74LS48	.70	74LS221	1.10
74LS51	.24	74LS240	.95
74LS55	.35	74LS241	.95
74LS74	.35	74LS244	.95
74LS75	.40	74LS245	1.65
74LS76	.38	74LS248	1.00
74LS78	.50	74LS249	.90
74LS83	.70	74LS251	1.20
74LS86	.38	74LS253	.80
74LS90	.60	74LS257	.80
74LS91	.65	74LS258	.80
74LS92	.55	74LS259	1.25
74LS93	.60	74LS260	.90
74LS95	.80	74LS273	1.50
74LS107	.38	74LS275	3.00
74LS109	.38	74LS279	.50
74LS112	.40	74LS283	.75
74LS113	.40	74LS373	1.90
74LS114	.45	74LS374	1.50
74LS122	.40	74LS377	1.40
74LS123	.85		

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74S00	.35	74S86	1.10
74S02	.38	74S112	1.45
74S03	.38	74S132	1.10
74S04	.45	74S138	.95
74S05	.65	74S140	1.25
74S08	.40	74S158	1.25
74S10	.55	74S174	.95
74S15	.55	74S175	.95
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74S22	.75	74S182	2.75
74S30	.35	74S188	3.50
74S37	1.25	74S240	3.50
74S51	.60	74S244	3.50
74S65	.95	74S471	9.50
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7918
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10/5.30	14	10/1.30
10/5.70	16	10/1.40
10/8.70	18	10/1.80
10/9.70	20	10/2.70
10/12.70	22	10/2.70
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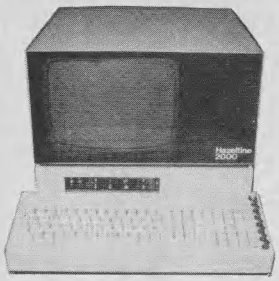

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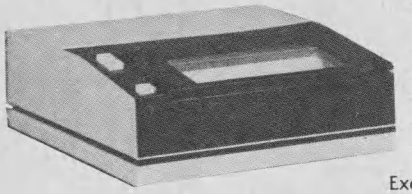
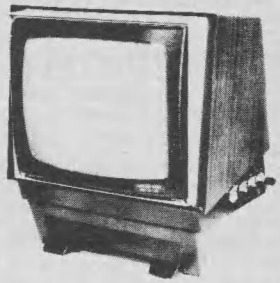


PERKIN-ELMER CAROUSEL 350 TERMINAL



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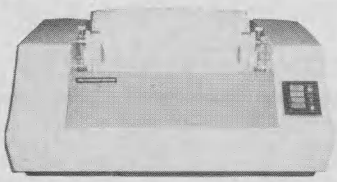

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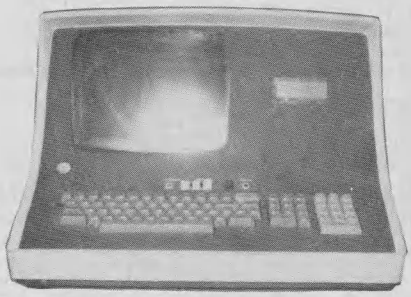

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INTRODUCING A BRAND NEW MICROCOMPUTER

VENTURE is a single board computer that is an adventure for the hobbyist. It is a learning, training computer as well as just plain fun for anyone who wants to get into a state-of-the-art computer at reasonable cost.

VENTURE comes in kit form or fully assembled and tested. You can get it in its minimum configuration for as little as $195.00 or take it all the way to floppy disks and voice. It can be expanded as a kit or fully assembled, at your own pace and choice.

VENTURE is a 16" by 20" main board with separate ASCII and HEX keyboards. It runs fast, almost 4 MHz, and has the capability of putting 1.5 megabyte of RAM and ROM on the board along with a variety of inexpensive options.

A 16-channel analog-to-digital converter allows use of joysticks, control functions, instrumentation, temperature sensing, etc. T1 sound generator, software controlled music, Votrax voice synthesizer and real time clock calendar add to its versatility.

VENTURE connects directly to a monitor or to your TV set through an RF modulator. And now for the heart of VENTURE . . . its video display. VENTURE has a high resolution programmable video display with up to 16,384 user-defined characters, alphanumeric symbols, special graphics or objects, such as space ships, etc. Each character is 8 pixels wide by 15 pixels high, with 2 grayscale maps; it has 64 levels of grayscale plus video invert/compliment and hidden screen update for a "snow" free display. The display is 512 x 512 pixel mapped with 2 planes of video RAM per display. VENTURE video is in short . . . astounding!

VENTURE has complete software support with full BASIC, 3 ROM monitors, disassembler/assembler/editor. It will run real-time video games, all RCA chip 8 programs and all current Quest 1802 software. VENTURE DOS will accommodate up to four 5¼" double density floppies. A complete 1802 programming book is available. All versions of VENTURE are shipped with a set of manuals written to be understood by the inexperienced as well as experienced user.

A standard 60-pin bus with 5 slots, parallel ports and 2 serial ports with full handshaking (75 to 9600 BAUD) allow expansion into floppy disks, color, EPROM programmer, printer, model of your choice. Later expansion will add a light pen, a universal user programmable music sound board, General Purpose Instrument Bus, and a high resolution color/grayscale pixel mapped video board.

On-Board Options

16 channel A to D; 5 slot 60 pin bus, 2 serial ports, parallel ports, 4 video options incl. color, 48K RAM, Votrax voice synthesizer, sound generator, EPROM, full BASIC disassembler, editor, assembler, metal cabinet, additional power supply, ASCII keyboard real time clock calendar.

Expansion Options

Floppy disk, EPROM programmer, light pen, universal user programmable music, sound board high resolution color/grayscale pixel mapped video board. General Purpose Instrument Bus, 8088 co-processor board.

Minimum VENTURE System $195.00

Kit includes CPU and control with 4K of RAM, 1K of scratchpad, 2K monitor, 1861 video graphics, cassette interface and separate HEX keyboard with LED displays for address and output. Power supply is included along with 2 game cassettes. The main board is 16" x 20" and includes space for all of the previously discussed on-board options. Full on-board expansion can be completed for under $1000.00. Call for further details, option prices, etc.

RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a tremendous value as it combines video, digital displays, LED displays, and music, all on a single board for $106.95.

The Super Elf expansion capability is virtually unlimited and you can do it inexpensively one step at a time. Expansion includes casstte interface, additional memory, color video, Basic, ASCII keyboard, printer, floppy, S-100 bus, RS232, etc.

The Super Elf comes complete with power supply and detailed 127 page instruction manual which includes over 40 pages of software, including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D. A monthly newsletter. Questdata is devoted exclusively to software for the Super Elf and there are many software books available at low cost.

The Super Elf computer system is now available as a series of bare boards as well as full kits and assembled.

Bare Boards: Super Elf $35.00. Super Expansion $35.00. Power Supply $10.00. S-100 Color $35.00. Dynamic RAM $40.00. Manuals $10.00. Super Basic $45.00.

"Eat & Run" cassette $14.95

Free 14 Page Brochure

Send or call for a free brochure on all details and pricing of the Super Elf and its expansion. We will get it right out to you!

Voltage Mate $18.50

$1.25 shipping. Switching regulator kit with adjustable AC/DC voltage conversion. 3 modes of operation; step up, step down, inversion. Jumper selectable modes of operation. Input voltage 5-15 VDC, output voltage −24 to +30 VDC, current draw 30-250 ma.

UHF Preamplifier Kit $34.95

$2.00 shipping. Improves uhf reception dramatically. 25 db gain assem. version **$57.50.** Articles Radio Elect: Mar, May, 1981.

Fluke Multimeters

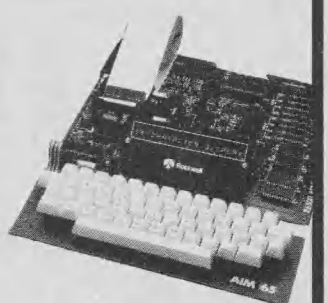
D800 $125.—D802 $189.—D804 $249.

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor; fully expandable. **$439.00.** 4K version **$454.00.** 4K Assembler **$35.00,** 8K Basic Interpreter **$65.00.**

Special small power supply 5V 2A 24V .5A assem. in frame **$59.00.** Molded plastic enclosure to fit both AIM 65 and power supply **$52.50.** AIM 65 1K in cabinet with power supply, switch, fuse, cord assem. **$571.00.** 4K **$586.00. A65/40-5000 AIM 65/40 w/16K RAM and monitor $1295.00.** RAM Board Kit (16K, $195) (32K, $215). VD640 Video Interface Kit **$119.00.** A&T **$149.00.** Complete AIM 65 in thin briefcase with power supply **$532.00.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$615.00.**

AIM 65/KIM/SYM/Super Elf 44 pin expansion board; board with 3 connectors **$22.95.** ***Send for complete list of all AIM products.**



Super Color S-100 Video Kit $99.00

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K, S-100 bus 1802, 8080, 8085, Z80, etc. **Dealers: Send for excellent pricing/margin program.**

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95,** Kit (P/N 2A) **$51.25,** Assembled (P/N 2C) **$62.95.**

PROTOTYPING BOARD (P/N 7907) **$21.95.**

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20,** Kit (P/N 210A) **$119.55.**

APPLE II GAME PADDLES Adam and Eve **$38.00.**

16K RAM Board to take you to 64K. Assem. **$67.** Kit **$57.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required.Bd only (P/N 101) **$11.95,** Kit (P/N 101A) **$42.89.**

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95.**

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95.**

PROM Eraser

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$83.00** (with timer **$119.00**).

Z80 MicroProfessor $135.00

Single board computer. Learning, teaching, prototyping. 2K RAM, keyboard, displays; cassette interface. Tiny BASIC **$19.00.** All fully assembled.

Z80 Microcomputer Kit $69.00

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$79.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud, Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June, July, Aug. *Radio Electronics*, 1981.

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface **$359.00.** Speech IC **$59.00.**

Direct Connect Modem $99.00

Fully assembled in case with RS232 cable. Orig/answer, 103 compatible, 9V battery or wallplug.

TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax. $10.00 min. VISA and MasterCard accepted. $1.00 insurance optional. Shipping: Add 5%; orders under $25.00—10%.

Prices subject to change

FREE: Send for your copy of our 1982 QUEST CATALOG. Include 88¢ stamp.

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¼"W x 8¾"D

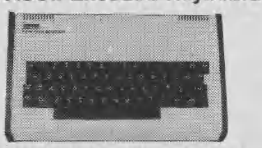
JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) .. **$59.95**

K19 19-Key Keyboard (Keyboard only) **$14.95**

DTE-HK (case only — 3½"Hx8¼"Wx8¾"D) **$44.95**

JE610 ASCII Encoded Keyboard Kit



The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and −12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14½"W x 8¾"D

JE610/DTE-AK (After assembled as pictured above) ... **$124.95**

JE610 Kit 62-Key Keyboard, PC Board, & Components (no case) .... **$ 79.95**

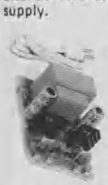
K62 62-Key Keyboard (Keyboard only) ... **$ 34.95**

DTE-AK (case only — 3¼"Hx11"Wx8¾"D) **$ 49.95**

NEW! **JE212 — Negative 12VDC Adapter Board Kit for JE610 ASCII KEYBOARD KIT** Kit/ Provides -12VDC from incoming 5VDC . **$9.95**

JE215 Adjustable Dual Power Supply

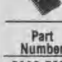
General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.



FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2"w x 5-1/16"L x 2"H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95

(Picture not shown but similar in construction to above)
JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95
JE205 Adapter Brd. (to JE200) ±5,±9 & ±12V. . $12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. . $19.95



HP-Display Sale-National

5082 Series — 0.43 Inch — 7-Segment

Part Number	Color	Description	1-3 Price	SALE PRICE
5082-7650	Hi Eff Red	CA - LHD	.99	4/$2.49
5082-7651	Hi Eff Red	CA - RHD	.99	4/$2.49
5082-7653	Hi Eff Red	CC - RHD	.99	4/$2.49
5082-7656	Hi Eff Red	Overflow ±1RHD	.99	4/$2.49
5082-7660	Yellow	CA - LHD	.99	4/$2.49
5082-7661	Yellow	CA - RHD	.99	4/$2.49
5082-7663	Yellow	CC - RHD	.99	4/$2.49
5082-7670	Green	CA - LHD	.99	4/$2.49
5082-7671	Green	CA - RHD	.99	4/$2.49
5082-7673	Green	CC - RHD	.99	4/$2.49
5082-7676	Green	Overflow ±1RHD	.99	4/$2.49
5082-7750	Red	CA - LHD	.99	4/$2.49
5082-7751	Red	CA - RHD	.99	4/$2.49
5082-7756	Red	Overflow ±1RHD	.99	4/$2.49
5082-7760	Red	CC - RHD	.99	4/$2.49

CA-Comm. Anode CC-Comm. Cathode LHD/RHD-Left/right hand dec.

UTIC
Mini Stereo AM/FM Receiver

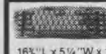
CLOSE-OUT!

WITH HEADPHONES For Joggers, Cyclists, Skaters & Sports Events

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3⅛" x 4⅞" x 1". Wt. 6 oz.

Model 2830 . . . . $29.95

KEYBOARDS — POWER SUPPLIES



16⅞"L x 5¼"W x 1⅞"H

MICRO SWITCH 69-KEY KEYBOARD
Data Entry Keyboard, Encoded Output: 8-bit Parallel EBC DIC. Switching: Hall Effect, 24-pin Edge Card Connection. Complete with Pin Connection.
Part No. KB69SD12-2 (Fits into DTE-20 Enclosure) . . . . $19.95 each

16¾"L x 5½"W x 1⅞"H

DATANETICS 74-KEY KEYBOARD
ASCII Encoded Keyboard, Output: Even Parity ASCII, Supply voltage +5, -12 volt. Switching: Mechanical SPST — 50-pin Connection. Complete with Pin Connection.
Part No. KB354 (Fits into DTE-20 Enclosure) . . . . $29.95 each

23"Lx5¾"Wx1-3/8"H

MICRO SWITCH 85-KEY KEYBOARD
Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main Keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.
Part No. 85SD18-1 . . . . $29.95 each

18¼"L x 5¾"W x 1⁹⁄₁₆"H

MICRO SWITCH 88-KEY KEYBOARD (PARALLEL)
Data Entry Keyboard used in a Diablo 1640 Terminal. Supply Voltage: +5V, -12V. Switching: Hall Effect — 10-pin Edge Card Connection. Schematic Included. Uses 8048 Encoder Chip.
Part No. 88SD22 (Fits into DTE-20 Enclosure) . . . . $69.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED Transaction Tech
Output +5VDC @ 1 amp (also +30VDC) reg. Input 115VAC 60Hz. Two-tone (black/beige) self-enclosed case. 6 ft., 3 cond. black power cord. Size: 6½"W x 7"D x 2¼"H. Wt. 3 lbs.
Part No. PS51194 . . . . $19.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED B Industries
Output +5VDC @ 1 amp, +36-42VDC adj. 400mA or less. 30VAC (isol.) @ 1.5 amp. Input 115VAC 60Hz. Circ. brkr. re-set button. Blk. self-encl. case w/4 rubber feet. 6 ft., 3 cond. blk. pow. cord. On/off switch. 6¾"W x 7¾"D x 3-7/8"H - wt. 7 lbs.
Part No. PS4070 . . . . $24.95 each

POWER SUPPLY — 5VDC @ 3 AMP REGULATED Deltron
Input: 115VAC, 47-440Hz. Output: 5VDC Adjustable @ 3 amp, 6VDC @ 2.5 amp. Adjustable current limit, Ripple & Noise: 1MV rms, 5MV p-p — 2 mounting surfaces. UL recognized. Size: 4"W x 4½"L x 2-7/16"H - wt. 2 lbs.
Part No. QPS-1 . . . . $29.95 each

POWER SUPPLY — 5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.6 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp. 8 ft. blk. pow. cord. 11½"W x 13¼"D x 3¾"H. Wt. 6 lbs.
Part No. PS94V0 . . . . $49.95 each

MULTI-VOLTAGE POWER SUPPLY — +5, +12, —12VDC REG.
Input: 105-125VAC, 47-63Hz/205-250VAC, 47-63Hz. Output: +5VDC @ 2 amps Adj., 5VDC @ 50mA Fixed, +12VDC @ 1 amp Adj., —12V @ 2 amp adj. Overvoltage protection. Size: 12⅛"L x 4-7/8"W x 3¾"D.
Part No. RA0250 . . . . $39.95 each

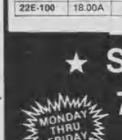
SOC 2-6 (Pictured)

SORENSEN Regulated Power Supplies

Sorensen's open construction (SOC) power supplies are series-regulated solid-state systems, designed to provide reg. DC voltages at 6 levels (2-28 v/range). These units are open-framed on sturdy black anodized aluminum for excellent mounting.

FEATURES: 115/208/230VAC input @ 50-63Hz. Low Ripple: 1.5mVrms, 5mV P-P maximum. Adjustable current limit. Voltage adjustment control. All schematics and specifications supplied with unit. Series A,B,C,E have three mounting surfaces (Series F, bottom mounting only).

Part No.	Series	Output Voltage Adjustment Range min.	max.	Output Current amps (Adc) @40°C	@50°C	@60°C	Size (Inches)	Weight	Price
SOC 2-6	B	1.9	2.1	6.0	4.9	3.8	5.62 x 4.88 x 2.50	4.3 lbs.	$19.95
SOC 2-25	F	1.9	2.1	25.0	21.5	17.5	16.00 x 4.88 x 4.88	16 lbs.	29.95
SOC 5-18	E	4.25	5.25	18.0	15.0	12.0	14.00 x 4.88 x 2.75	12 lbs.	39.95
SOC 5-25	F	4.25	5.25	25.0	21.5	17.5	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 12-11	E	11.4	12.6	11.0	9.2	6.8	14.00 x 4.88 x 1.62	12 lbs.	44.95
SOC 12-15	F	11.4	12.6	15.0	12.75	9.5	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC15-5	C	14.25	15.75	5.0	4.2	3.5	7.00 x 4.88 x 3.37	6.6 lbs.	39.95
SOC 15-9.5	E	14.25	15.75	9.5	7.6	5.6	14.00 x 4.88 x 1.62	12 lbs.	44.95
SOC 15-13	F	14.25	15.75	13.0	10.5	8.0	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 28-0.8	A	26.6	29.4	0.8	.64	.45	4.00 x 4.88 x 1.62	2 lbs.	24.95



22D300 (Pictured)

Powertec Sub-Modular DC Power Supplies

SM Series power supplies include rectifying, filtering, regulating, overload and overvoltage protection functions. You need only connect the sub-module to the appropriate secondary transformer tap and bolt the unit to a heatsink.

REGULATION: LINE; .10% for a change from -10% to +10% input voltage. LOAD; .15% for a 0-100% load change (units below 5V output maintain 5V regulation). OUTPUT RIPPLE: 1mV RMS, 3mV P-P typical, 5mV P-P maximum. INPUT CHARACTERISTICS: Requires low-level AC input. Derate output current 15% for operations at 50Hz.

Part Number	−100 *4.75V to 7.0V	−200 *7.0V to 10.5V	−300 *10.5V to 15.75V	−500 *22.0V to 30.0V	Power Transformer Requirements (Transformers Not Included) Primary	Secondary	Size (Inches)	Wt.	Price
22AA-300			0.23A		115–120VAC	17VAC .5A no CT	2.50 x 3.00 x .98	2 oz.	$14.95
22B-200		2.2A			115–120VAC	22VAC .3A w/CT	3.00 x 5.75 x 1.18	8 oz.	14.95
22B-300			1.7A		115–120VAC	28VAC 2.5A w/CT	2.75 x 5.75 x 1.18	8 oz.	19.95
22C-100	6.0A				115–120VAC	16VAC 8A w/CT	2.80 x 7.50 x 1.18	8 oz.	24.95
22C-500				2.5A	115–120VAC	48VAC 3A w/CT	2.80 x 7.50 x 1.18	8 oz.	24.95
22D-300			6.8A		115–120VAC	28VAC 10A w/CT	3.00 x 7.00 x 3.30	2 lbs.	24.95
22E-100	18.00A				115–120VAC	16VAC 24A w/CT	2.90 x 7.00 x 3.30	2 lbs.	29.95

*Voltage Adjustment Range — Current ratings apply over entire voltage range.

★ SHIPMENT IN 24 HOURS ★

MONDAY THRU FRIDAY

7:00AM to 5:00PM (PST)

NEW HOURS

Call: (415) 592-8097

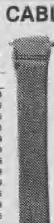
Custom Jumpers!

JUMPER AND CABLE ASSEMBLIES

Custom Cables!

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.



JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ14-1	924102-12	14	single end	12"	$1.79
DJ14-2	924102-24	14	single end	24"	2.05
DJ14-3	924102-36	14	single end	36"	2.35
DJ14-1-14	924106-12	14	double end	12"	3.20
DJ14-2-14	924106-24	14	double end	24"	3.49
DJ14-3-14	924106-36	14	double end	36"	3.79
DJ16-1	924112-12	16	single end	12"	1.85
DJ16-2	924112-24	16	single end	24"	2.19
DJ16-3	924112-36	16	single end	36"	2.59
DJ16-1-16	924116-12	16	double end	12"	3.35
DJ16-2-16	924116-24	16	double end	24"	3.69
DJ16-3-16	924116-36	16	double end	36"	4.05
DJ24-1	924122-12	24	single end	12"	2.69
DJ24-2	924122-24	24	single end	24"	3.39
DJ24-3	924122-36	24	single end	36"	3.95
DJ24-1-24	924126-12	24	double end	12"	4.79
DJ24-2-24	924126-24	24	double end	24"	5.29
DJ24-3-24	924126-36	24	double end	36"	5.89
DJ40-1	924132-12	40	single end	12"	5.89
DJ40-2	924132-24	40	single end	24"	6.79
DJ40-3	924132-36	40	single end	36"	7.69
DJ40-1-40	924136-12	40	double end	12"	10.95
DJ40-2-40	924136-24	40	double end	24"	11.89
DJ40-3-40	924136-36	40	double end	36"	12.79

STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4 foot lengths. **Call today.**

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
DB25P-4	4 feet	1-DB25P	$ 9.95 ea.
DB25S-4	4 feet	1-DB25S	10.95 ea.
DB25P-4-P	4 feet	2-DB25P	16.95 ea.
DB25P-4-S	4 feet	1-DB25P/1-DB25S	17.95 ea.
DB25S-4-S	4 feet	2-DB25S	18.95 ea.

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Postage — Add 5% plus $1.50 Insurance
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Spec Sheets — 30¢ each
Send $1.00 Postage for your
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1355 SHOREWAY ROAD, BELMONT, CA 94002
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11/82

5¼" Mini-Floppy Disc Drive

FOR TRS-80 MODEL I (Industry Standard)

Pertec Computer Corp.

Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6 amps max., +5VDC (±0.25V) 0.8 amps max. Unit as pictured at left (does not incl. case, power supply or cables). 30-page data book included. Weighs 3½ pounds. Size: 5¾"W x 8"D x 3¼"H

Limited Quantity!

Part No.	Price
FD200	$179.95

Single-sided, 40 tracks, 250K bytes capacity

FD250	$199.95

Double-sided, 35 tracks, 438K bytes capacity

EXPAND YOUR TRS-80

to 16K, 32K, or 48K

**Model 1 = From 4K to 16K Requires (1) One Kit
Model 3 = From 4K to 48K Requires (3) Three Kits
Color = From 4K to 16K Requires (1) One Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-80 16K Conversion Kit

Kit comes complete with 8 each MM5290 (UPD416/4116) 16K Dynamic RAM (*ns) and documentation for conversion.

TRS-16K2 *150ns $14.95
TRS-16K3 *200ns $12.95
TRS-16K4 *250ns $10.95

TRS-80 Color 32K or 64K Conversion Kit

Kit comes complete with 8 ea. 4164-2 (200ns). 64K Dyn. RAMs & conversion documentation. Converts TRS-80 color computers from 4K-32K Memory or 16K-64K Memory.

TRS-64K2 (200ns) $54.95

Universal Computer Keyboard Enclosure

"DTE" Blank Desk-Top Enclosures are designed for easy modification. High strength epoxy molded end pieces in mocha brown finish. Sliding rear/bottom panel for service/component access. Top/bott. panels .080" thick alum. alodine type 1200 finish (gold tint color) for best paint adhesion after modification. Vented top & bottom panels for cooling efficiency.

DTE-20 Panel width 20" **$39.95**

Sprite-style Fan

- 36cfm free air delivery
- 3.125" sq. x 1.665" depth
- 10 yrs. cont. duty at 20°C
- 115V 50/60Hz
- For Apple users

*Metal Frame

PWS2107U Cleaned & tested (used) . . . $ 9.95 ea.
***PWS2107F** New . . . . $14.95 ea.

Muffin-style Fan

- 105cfm free air delivery
- 4.68" sq. x 1.50" depth.
- 10 yrs. cont. duty at 20°C
- Impedance protected, ambients to 70°C
- 115V 50/60Hz 14W Wt. 17 oz.

*Metal Frame

MU2A1-U Cleaned & tested (used) . . . . . . $9.95 ea.
***MU2A-1N** New . . . . $14.95 ea.

JOYSTICKS

JS-5K (Pictured)

JS-5K	5K Linear Taper Pots	$5.25
JS-100K	100K Linear Taper Pots	$4.95
JS-150K	150K Linear Taper Pots	$4.75
JVC-40	40K (2) Video Controller in Case	$4.95

UV-EPROM Eraser

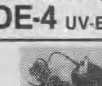
8 Chips — 51 Minutes

1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

UVS-11EL Replacement Bulb $16.95

DE-4 UV-EPROM Eraser $79.95

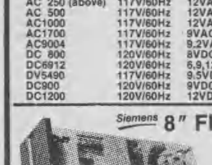


AC250 (Pictured)

Wall Transformers AC and DC Types

Part No.	Input	Output	Price
AC 250 (above)	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
AC9004	117V/60Hz	9.2VAC 2.5 amp	$2.95 or 2/$4.95
DC 800	120V/60Hz	8VDC 400mA	$1.95 or 2/$2.95
DC6912	120V/60Hz	6,9,12VDC 300mA	$9.95
DV5490	117V/60Hz	9.5VDC 275mA	$2.49 or 2/$3.95
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$2.95 or 2/$4.95

Siemens 8" Floppy Disk Drive



- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

The **FDD100-8 8" Floppy Disk Drive** (Industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Diskette I, or equivalent disk cartridge. A hard-sectored option is available. Power: 115/230VAC @ 50-60Hz, +24VDC @ 1.7 amps max., +5VDC @ 1.2 amps max. Unit as pictured above (does not include case, power supply, or cables). Size: 8.55"W x 14"L x 4.5"H. Weighs 12 lbs.

Part No.		Price
FDD100-8	Buy 1 for	$299.95 each
FDD100-8	Buy 2 for	$279.95 each
FDD100-8	*Buy 10 for*	*$249.95 each*

Circle 41 on Reader Service card.

7400

**Number of Pins of each I.C. for easy Socket purchase

Part No.	**Pins	Price	Part No.	**Pins	Price	Part No.	**Pins	Price
SN7400N	14	.19	SN7472N	14	.29	SN74156N	16	.59
SN7401N	14	.19	SN7473N	14	.35	SN74157N	16	.59
SN7402N	14	.25	SN7474N	14	.35	SN74160N	16	.69
SN7403N	14	.25	SN7475N	16	.45	SN74161N	16	.69
SN7404N	14	.25	SN7476N	16	.35	SN74162N	16	.69
SN7405N	14	.25	SN7479N	14	4.95	SN74163N	16	.69
SN7406N	14	.29	SN7480N	14	.69	SN74164N	14	.69
SN7407N	14	.29	SN7482N	14	1.19	SN74165N	16	.69
SN7408N	14	.25	SN7483N	16	.59	SN74166N	16	.89
SN7409N	14	.25	SN7485N	16	.59	SN74167N	16	2.79
SN7410N	14	.25	SN7486N	14	.35	SN74170N	16	1.29
SN7411N	14	.25	SN7489N	16	2.25	SN74172N	24	4.95
SN7412N	14	.35	SN7490N	14	.39	SN74173N	16	.69
SN7413N	14	.35	SN7491N	14	.59	SN74174N	16	.69
SN7414N	14	.49	SN7492N	14	.39	SN74175N	16	.69
SN7416N	14	.25	SN7493N	14	.39	SN74176N	14	.69
SN7417N	14	.25	SN7494N	14	.69	SN74177N	14	.69
SN7420N	14	.19	SN7495N	14	.49	SN74179N	16	1.49
SN7421N	14	.35	SN7496N	16	.49	SN74180N	14	.69
SN7422N	14	.45	SN7497N	16	2.75	SN74181N	24	1.95
SN7423N	16	.59	SN74100N	24	1.49	SN74182N	16	.89
SN7425N	14	.29	SN74104N	14	.89	SN74184N	16	1.95
SN7426N	14	.29	SN74105N	14	.89	SN74185N	16	1.95
SN7427N	14	.25	SN74107N	14	.29	SN74190N	16	.69
SN7428N	14	.49	SN74109N	16	.39	SN74191N	16	.69
SN7430N	14	.25	SN74116N	24	1.49	SN74192N	16	.69
SN7432N	14	.29	SN74121N	14	.39	SN74193N	16	.69
SN7437N	14	.25	SN74122N	14	.55	SN74194N	16	.69
SN7438N	14	.29	SN74123N	16	.49	SN74195N	16	.69
SN7439N	14	.59	SN74125N	14	.45	SN74196N	14	.89
SN7440N	14	.19	SN74126N	14	.45	SN74197N	14	.89
SN7441N	16	.89	SN74132N	14	.49	SN74198N	24	1.19
SN7442N	16	.45	SN74136N	14	.69	SN74199N	24	1.19
SN7443N	16	.99	SN74141N	16	.69	SN74221N	16	1.19
SN7444N	16	.99	SN74142N	16	2.95	SN74251N	16	.79
SN7445N	16	.69	SN74143N	24	2.95	SN74276N	20	1.95
SN7446N	16	.69	SN74144N	24	2.95	SN74279N	16	.79
SN7447N	16	.69	SN74145N	16	.59	SN74283N	16	1.49
SN7448N	16	.69	SN74147N	16	1.49	SN74284N	16	2.95
SN7450N	14	.19	SN74148N	16	1.19	SN74285N	16	2.95
SN7451N	14	.19	SN74150N	24	1.19	SN74365N	16	.55
SN7453N	14	.19	SN74151N	16	.59	SN74366N	16	.55
SN7454N	14	.19	SN74152N	14	.59	SN74367N	16	.55
SN7459A	14	.25	SN74153N	16	.59	SN74368N	16	.55
SN7460N	14	.19	SN74154N	24	1.25	SN74390N	16	1.49
SN7470N	14	.29	SN74155N	16	.59	SN74393N	14	1.49

74LS

74LS00	14	.25				74LS192	16	.79
74LS01	14	.25				74LS193	16	.79
74LS02	14	.25	74LS92	14	.55	74LS194	16	.69
74LS03	14	.25	74LS93	14	.55	74LS195	16	.69
74LS04	14	.29	74LS95	14	.79	74LS197	14	.79
74LS05	14	.29	74LS96	16	.89	74LS221	16	.89
74LS08	14	.29	74LS107	14	.39	74LS240	20	1.09
74LS09	14	.29	74LS109	16	.39	74LS241	20	1.09
74LS10	14	.29	74LS112	16	.39	74LS242	14	1.09
74LS11	14	.35	74LS113	14	.39	74LS243	14	1.09
74LS12	14	.35	74LS114	14	.39	74LS244	20	1.09
74LS13	14	.39	74LS122	14	.49	74LS245	20	1.49
74LS14	14	.59	74LS123	16	.79	74LS247	16	1.09
74LS15	14	.35	74LS125	14	.49	74LS248	16	1.09
74LS20	14	.29	74LS126	14	.49	74LS249	16	1.09
74LS21	14	.29	74LS132	14	.59	74LS251	16	.59
74LS22	14	.29	74LS133	16	.59	74LS253	16	.59
74LS26	14	.29	74LS136	14	.39	74LS257	16	.59
74LS27	14	.29	74LS138	16	.59	74LS258	16	.59
74LS28	14	.35	74LS139	16	.59	74LS260	14	.59
74LS30	14	.29	74LS151	16	.59	74LS266	14	.69
74LS32	14	.35	74LS153	16	.59	74LS273	20	1.49
74LS33	14	.55	74LS154	24	.99	74LS279	16	.49
74LS37	14	.35	74LS155	16	.69	74LS283	16	.69
74LS38	14	.35	74LS156	16	.69	74LS290	14	.69
74LS40	14	.29	74LS157	16	.69	74LS293	14	.79
74LS42	16	.55	74LS158	16	.59	74LS298	16	.89
74LS47	16	.75	74LS160	16	.69	74LS352	16	1.29
74LS48	16	.75	74LS161	16	.69	74LS353	16	1.29
74LS49	14	.75	74LS162	16	.69	74LS365	16	.49
74LS51	14	.25	74LS163	16	.69	74LS366	16	.49
74LS54	14	.25	74LS164	14	.69	74LS367	16	.49
74LS55	14	.29	74LS165	16	1.19	74LS368	16	.49
74LS73	14	.39	74LS168	16	1.19	74LS373	20	1.29
74LS74	14	.39	74LS169	16	1.19	74LS374	20	1.29
74LS75	16	.39	74LS170	16	1.49	74LS375	16	.65
74LS76	16	.39	74LS173	16	.69	74LS386	14	.45
74LS78	14	.39	74LS174	16	.59	74LS393	14	1.19
74LS83	16	.65	74LS175	16	.59	74LS399	16	1.49
74LS85	16	.69	74LS181	24	2.49	74LS670	16	1.49
74LS86	14	.39	74LS190	16	.89	81LS95	20	1.49
74LS90	14	.55	74LS191	16	.89	81LS97	20	1.49

74S/PROMS*

74S00	14	.35				74S243	14	2.49
74S02	14	.35	74S124	16	2.95	74S244	20	2.49
74S03	14	.35	74S133	16	.45	74S251	16	1.19
74S04	14	.45	74S134	16	.50	74S253	16	1.19
74S05	14	.45	74S135	16	.69	74S257	16	1.19
74S08	14	.39	74S136	14	1.39	74S258	16	1.19
74S09	14	.39	74S138	16	.89	74S260	14	.79
74S10	14	.35	74S139	16	.89	74S280	14	1.95
74S11	14	.35	74S140	14	.55	74S287*	16	1.95
74S15	14	.35	74S151	16	.99	74S288*	16	1.95
74S20	14	.35	74S153	16	.99	74S373	20	2.49
74S22	14	.35	74S157	16	.99	74S374	20	2.49
74S30	14	.35	74S158	16	.99	74S387*	16	1.95
74S32	14	.45	74S160	16	2.49	74S471*	20	5.95
74S38	14	.89	74S174	16	.99	74S472*	20	4.95
74S40	14	.39	74S175	16	.99	74S473*	20	4.95
74S51	14	.35	74S188*	16	1.49	74S474*	24	4.95
74S64	14	.39	74S194	16	1.49	74S475*	24	4.95
74S65	14	.39	74S195	16	1.49	74S570*	16	2.95
74S74	14	.55	74S196	14	1.49	74S571*	16	2.95
74S86	14	.55	74S240	20	2.25	74S572*	18	4.95
74S112	16	.55	74S241	20	2.25	74S573*	18	4.95
74S113	14	.55	74S242	14	2.49	74S940	20	2.49
74S114	14	.55				74S941	20	2.49

CA—LINEAR

CA3010H		.99	CA3060N	16	3.25	CA3089N	16	1.69
CA3013H		2.15	CA3080E	8	.89	CA3096N	16	1.19
CA3023H		3.25	CA3081N	16	1.49	CA3130E	8	1.49
CA3035H		5.95	CA3082N	16	1.49	CA3140E	8	.99
CA3039H		1.35	CA3083N	16	1.49	CA3160H		1.95
CA3046N	14	.89	CA3086N	14	.69	CA3401N	14	.59
CA3059N	14	3.25				CA3600N	14	3.95

CD—CMOS

CD4000	14	.29	CD4040	16	.79	CD4098	16	1.95
CD4001	14	.29	CD4041	14	.79	CD4506	16	1.19
CD4002	14	.29	CD4042	16	.69	CD4507	14	.39
CD4006	14	.89	CD4043	16	.79	CD4508	24	3.95
CD4007	14	.29	CD4044	16	.79	CD4510	16	.89
CD4009	16	.39	CD4046	16	.89	CD4511	16	.89
CD4010	16	.39	CD4047	14	.89	CD4512	16	.89
CD4011	14	.29	CD4048	16	.39	CD4514	24	1.79
CD4012	14	.15	CD4049	16	.39	CD4515	24	1.79
CD4013	14	.39	CD4050	16	.39	CD4516	16	.99
CD4014	16	.79	CD4051	16	.79	CD4518	16	.99
CD4015	16	.39	CD4052	16	.79	CD4519	16	.39
CD4016	14	.39	CD4053	16	.79	CD4520	16	.79
CD4017	16	.75	CD4056	16	2.95	CD4526	16	1.19
CD4018	16	.79	CD4059	24	7.95	CD4528	16	1.19
CD4019	16	.39	CD4060	16	.89	CD4529	16	1.19
CD4020	16	.75	CD4066	14	.39	CD4543	16	1.19
CD4021	16	.79	CD4068	14	.39	CD4562	14	6.95
CD4022	16	.79	CD4069	14	.29	CD4566	16	1.39
CD4023	14	.29	CD4070	14	.39	CD4583	16	2.49
CD4024	14	.69	CD4071	14	.29	CD4584	14	.59
CD4025	14	.23	CD4072	14	.29	CD4723	16	1.19
CD4026	16	2.49	CD4073	14	.29	CD4724	16	1.19
CD4027	16	.45	CD4075	14	.29	MC14409	16	13.95
CD4028	16	.69	CD4076	16	.79	MC14410	16	13.95
CD4029	16	.79	CD4078	14	.49	MC14411	24	11.95
CD4030	14	.39	CD4081	14	.29	MC14412	16	13.95
CD4034	24	1.95	CD4082	14	.29	MC14419	16	7.95
CD4035	16	.89	CD4093	14	.49	MC14433	24	13.95
(More in Catalog)						MC14538	16	1.19
						MC14541	14	1.19

MICROPROCESSOR COMPONENTS

MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$9.95
2650	40	MPU	14.95
IDM2901ADC	40	CPU—4-bit slice (Com. Temp. Gr.)	19.95
MCS6502	40	MPU w/Clock (65K bytes mem.)	9.95
MC6802CP	40	MPU w/Clock and RAM	7.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N-6	40	CPU-Sgl. chip 8-bit (128 bts. Ram)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	5.95
INS8070N	40	CPU (64 bytes RAM)	11.95
INS8073N	40	CPU w/Basic Micro Interpreter	14.95
P8085A	40	CPU	5.95
Z80, Z80A, Z80B, Z8000 SERIES			
Z80	40	CPU (MK3880N)(780C) 2MHz	$4.95
Z80-CTC	28	Counter Timer Circuit	5.95
Z80-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80-DMA	40	Direct Memory Access Circuit	15.95
Z80-P10	40	Parallel I/O Interface Controller	5.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded)	15.95
Z80-S10/1	40	Serial I/O (Lacks DTRB)	15.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB)	15.95
Z80-S10/9	40	Serial I/O	15.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz	5.95
Z80A-CTC	28	Counter Timer Circuit	5.95
Z80A-DART	40	Dual Asynchronous Rec./Trans	11.95
Z80A-DMA	40	Direct Memory Access Circuit	17.95
Z80A-P10	40	Parallel I/O Interface Controller	5.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded)	16.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB)	16.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB)	16.95
Z80A-S10/9	40	Serial I/O	16.95
Z80B	40	CPU (MK3880N-6) 6MHz	11.95
Z80B-CTC	28	Counter Timer Circuit	13.95
Z80B-P10	40	Parallel I/O Interface Controller	13.95
Z8001	48	CPU Segmented	51.95
Z8002	40	CPU Non-Segmented	55.95
Z8030	40	Serial Comm. Controller	44.95
Z8036	40	Counter/Timer & Parallel I/O Unit	29.95
6800/68000 SERIES			
MC6800	40	MPU	4.95
MC6802CP	40	MPU with clock and RAM	7.95
MC6810API	24	128x8 Static RAM	3.95
MC6821	40	Peripheral Inter. Adapt (MC6820)	4.95
MC6828	24	Priority Interrupt Controller	15.95
MC6830L8	24	1024x8-bit ROM (MC68A30-8)	10.95
MC6850	24	Asynchronous Comm. Adapter	4.95
MC6852	24	Synchronous Serial Data Adapter	5.75
MC6860	24	0-600bps Digital MODEM	9.95
MC6862	24	2400bps Modulator	12.95
MC6880A	16	Quad 3-state bus. trans. (MC8T26)	2.25
MC68000L8	64	MPU 16-Bit (8MHz)	69.95
MC68488P	40	General Purpose Int. Adapter	8.95
MC68652P2	40	Multi. Protocol Comm. Controller	24.95
MC68661PB	28	Enhanced Prog. Comm. Int.	8.95
8080A SERIES			
INS8080A	40	CPU	3.95
TMS5501	40	Synchronous Data Interface (SIRC)	14.95
INS8154	40	128 Byte RAM 16-Bit I/O	13.95
INS82C06	20	Octal D Flip Flop Tri-State (74C374)	2.49
DP8212	24	8-bit Input/Output (74S412)	2.25
DP8214	24	Priority Interrupt Control	3.95
DP8216	16	Bi-Directional Bus Driver	2.25
DP8224	16	Clock Generator/Driver	2.25
DP8226	16	Bus Driver	2.25
DP8228	28	System Cont./Bus Driver (74S428)	3.49
DP8238	28	System Controller (74S438)	4.49
INS8243	24	I/O Expander for 48 Series	5.95
INS8245	18	16-Key Keyboard Encoder (74C922)	4.49
INS8246	20	20-Key Keyboard Encoder (74C923)	4.95
INS8247	28	Display Controller (74C911)	8.95
INS8248	28	Display Controller (74C912)	8.95
INS8250N	40	Asyn. Comm. Element (INS8250)	10.95
DP8251	28	Prog. Comm. I/O (USART)	4.49
DP8253	24	Prog. Interval Timer	6.95
DP8255	40	Prog. Peripheral I/O (PPI)	4.49
DP8257	40	Prog. DMA Control	7.95
DP8259	28	Prog. Interrupt Control	6.95
DP8275	40	Prog. CRT Controller	29.95
DP8279	40	Prog. Keyboard/Display Interface	6.95
DP8303	20	8-Bit Tri-State Bi-Directional Trans	3.95
DP8304	20	8-bit Bi-Directional Receiver	2.49
DP8307	20	8-bit Bi-Directional Receiver	2.49
DP8308	20	8-bit Bi-Directional Receiver	2.49
DP8310	20	Octal Latched Peripheral Driver	4.95
DP8311	20	Octal Latched Peripheral Driver	4.95

MICROPROCESSOR MANUALS & DATA BOOKS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00
10400	1982 Intel Data Book (1405 pg.)	14.95
30001	1981 Nat. CMOS Book (628 pg.)	6.95
30002	1980 Nat. Interface Book (640 pg.)	6.95
30003	1982 Nat. Linear Book (1952 pg.)	11.95
30005	1981 Nat. TTL Book (624 pg.)	9.95
30008	1980 Nat. Memory Data Book (464 pg.)	6.95
30011	1980 Nat. Linear Applications (736 pg.)	15.95
30013	1983 Zilog Data Book (641 pg.)	7.95
205610	1981 Intel Peripheral Design (828 pg.)	9.95

DYNAMIC RAMS

Part No.	**Pins			Price
1103	18	1024x1	(300ns)	.99
4027	16	4096x1	(250ns)	2.49
4116N-2	16	16,384x1	(150ns)	1.89 - 8/14.95
4116N-3	16	16,384x1	(200ns)	1.69 - 8/12.95
4116N-4	16	16,384x1	(250ns)	1.49 - 8/10.95
4164N-150	16	65,536x1	(150ns)	7.95 - 8/59.95
4164N-200	16	65,536x1	(200ns)	7.49 - 8/54.95
MM5261	18	1024x1	(300ns)	.49 - 8/1.95
MM5262	22	2048x1	(365ns)	.49 - 8/1.95
MM5270	18	4096x1	(250ns) MK4096	4.95
MM5280	22	4096x1	(200ns) 2107	3.95
MM5290-2	16	16,384x1	(150ns)	1.89 - 8/14.95
MM5290-3	16	16,384x1	(200ns)	1.69 - 8/12.95
MM5290-4	16	16,384x1	(250ns)	1.49 - 8/10.95
MM5298-3	16	8192x1	(200ns)	1.69
STATIC RAMS				
1101	16	256x1	(650ns)	1.49
2101	22	256x4	(450ns) 8101	2.49
2102	16	1024x1	(350ns)	.89
21L02	16	1024x1	(450ns) L.P.	1.49
2111	18	256x4	(450ns) 8111	2.95
2112	16	256x4	(450ns) MOS	2.95
2114	18	1024x4	(450ns)	1.95 - 8/13.95
2114L	18	1024x4	(450ns) L.P.	2.25 - 8/15.95
2114-2	18	1024x4	(200ns)	2.25 - 8/15.95
2114L-2	18	1024x4	(200ns) L.P.	2.49 - 8/17.95
2141-3	18	4096x1	(150ns)	3.95
2147	18	4096x1	(70ns)	4.95
2148	18	1024x4	(70ns)	8.95
TMS4044	18	4096x1	(450ns)	3.95
TMS4045	18	1024x4	(450ns)	3.95
5101	22	256x4	(450ns) CMOS	4.95
MM5257	18	4096x1	(450ns) 4044	4.95
HM6116P-3	24	2048x8	(150ns) CMOS	7.95
HM6116-4	24	2048x8	(200ns) CMOS	6.95
HM6116LP-4	24	2048x8	(200ns) L.P. CMOS	7.95
7489	16	16x4	(50ns) 3101	2.25
74C920	22	256x4	(250ns) CMOS (6551)	3.95
74C921	18	256x4	(250ns) CMOS	3.95
74C929	16	1024x1	(250ns) CMOS (6501)	3.95
74C930	18	1024x1	(250ns) CMOS (6518)	3.95
74S189	16	16x4	(35ns) 93405	1.95
74S200	16	256x1	(80ns) 93410	3.95
74S206	16	256x1	(60ns) 93411	3.95
74S289	16	16x4	(35ns) 3101	2.25
82S10	16	1024x1	(50ns) O.C. (93415)	3.95
82S25	16	16x4	(50ns) O.C. (74S289)	2.25
EPROMS				
1702A	24	256x8	(1us)	4.95
2708	24	1024x8	(450ns)	3.95
2708-5	24	1024x8	(550ns) SM00246	2.95
TMS2516	24	2048x8	(450ns) 2716	6.95
TMS2532	24	4096x8	(450ns) NMC2532	9.95
TMS2564	28	8192x8	(450ns)	19.95
TMS2716	24	2048x8	(450ns) 3 voltage	7.95
2716	24	2048x8	(450ns)	4.95
2716-1	24	2048x8	(350ns)	6.95
2732	24	4096x8	(450ns)	9.95
2758Q	24	1024x8	(450ns) single +5V	2.95
MM2764	28	8192x8	(450ns)	16.95
MM2764-3	28	8192x8	(300ns)	19.95
PROMS				
74S188	16	32x8	PROM O.C. (6330-1)	1.49
74S287	16	256x4	PROM T.S. (6301-1)	1.95
74S288	16	32x8	PROM T.S. (6331-1)	1.95
74S387	16	256x4	PROM O.C. (6300-1)	1.95
74S471	20	256x8	PROM T.S. (6309-1)	5.95
74S472	20	512x8	PROM T.S. (6349-1)	4.95
74S473	20	512x8	PROM O.C. (6348)	4.95
74S474	24	512x8	PROM T.S. (DM87S296N)	4.95
74S475	24	512x8	PROM O.C. (6340)	4.95
74S478	24	1024x8	PROM T.S. (TBP28S86)	8.95
74S570	16	512x4	PROM O.C. (6305)	2.95
74S571	16	512x4	PROM T.S. (6306)	2.95
74S572	18	1024x4	PROM O.C. (6352)	4.95
74S573	18	1024x4	PROM T.S. (82S137)	4.95
82S23	16	32x8	PROM O.C. (27S18)	2.95
82S115	24	512x8	PROM T.S. (27S15)	9.95
82S123	16	32x8	PROM T.S. (27S19)	2.95
82S126	16	256x4	PROM O.C. (27S20)	3.95
82S129	16	256x4	PROM T.S. (27S21)	3.95
82S130	16	512x4	PROM O.C. (27S12)	5.95
82S185	18	2048x4	PROM T.S. (TBP24S81)	9.95
DM87S180N	24	1024x8	PROM O.C. (82S180)	9.95
DM87S181N	24	1024x8	PROM T.S. (82S181)	9.95
DM87S184N	18	2048x4	PROM O.C. (82S184)	9.95
DM87S185N	18	2048x4	PROM T.S. (82S185)	9.95
DM87S190N	24	2048x4	PROM O.C. (82S190)	19.95
DM87S191N	24	2048x8	PROM T.S. (82S191)	19.95

DATA ACQUISITION

DC10		Mostek DC/DC Convert. +5V to -9V	2.95
MC3470P	18	Floppy Disk Read AMP System	4.95
MC1408L7	16	7-bit D/A Converter (DAC0807LCN)	2.49
MC1408L8	16	8-bit D/A Converter (DAC0808LCN)	2.95
ADC0804	20	8-bit A/D Converter (1 LSB)	3.49
DAC0806	16	8-bit D/A Converter (0.78% Lin.)	1.95
ADC0809	28	8-bit A/D Converter (8-Ch. Mult.)	4.49
AY-5-1013A	40	30K BAUD UART (TR1602)	4.95

INTERSIL

*Evaluation Kits

Part No.	**Pins	Function		Price
7045IPI	28	CMOS Precision Timer		14.95
7045EV/Kit*	28	Stopwatch Chip, XTL		19.95
7106CPL	40	3½ Digit A/D (LCD Drive)		9.95
7106EV/Kit*	40	IC, Circuit Board, Display		34.95
7107CPL	40	3½ Digit A/D (LED Drive)		11.95
7107EV/Kit*	40	IC, Circuit Board, Display		29.95
7116CPL	40	3½ Digit A/D LCD Dis. HLD.		16.95
7117CPL	40	3½ Digit A/D LED Dis. HLD.		15.95
7201IUS		Low Battery Volt Indicator		2.25
7205IPG	24	CMOS LED Stopwatch/Timer		12.95
7205EV/Kit*	24	Stopwatch Chip, XTL		14.95
7206CJPE	16	Tone Generator		4.95
7206CEV/Kit*	16	Tone Generator Chip, XTL		7.95
7207AIPD	14	Oscillator Controller		5.95
7207AEV/Kit*	14	Freq. Counter Chip, XTL		7.95
7208IPI	28	Seven Decade Counter		15.95
7209IPA	8	Clock Generator		3.95
7215IPG	24	4 Func. CMOS Stopwatch CKT		13.95
7215EV/Kit*	24	4 Func. Stopwatch Chip, XTL		14.95
7216AIJI	28	8 Digit Univ. Counter C.A.		29.95
7216CIJI	28	8 Digit Freq. Counter C.A.		24.95
7216DIPI	28	8 Digit Freq. Counter C.C.		19.95
7217IJI	28	4 Digit LED Up/Down Counter C.A.		10.95
7217AIPI	28	4 Digit LED Up/Down Counter C.C.		11.95
7224IPL	40	LCD 4½ Digit Up Counter DRI		10.95
7226AIJL	40	8 Digit Univ. Counter		29.95
7226AEV/Kit*	40	5 Function Counter Chip, XTL		74.95
7240IJE	16	CMOS Bin Prog. Timer/Counter		4.95
7242IJA	8	CMOS Divide-by-256 RC Timer		2.25
7250IJE	16	CMOS BCD Prog. Timer/Counter		6.00
7260IJE	16	CMOS BCD Prog. Timer/Counter		5.25
7555IPA	8	CMOS 555 Timer		1.45
7556IPD	14	CMOS 556 Timer		2.20
7611BCPA	8	CMOS Op Amp Comparator	5MV	2.25
7612BCPA	8	CMOS Op Amp Ext. Cmvr.	5MV	2.95
7621BCPA	8	CMOS Dual Op Amp Comp.	5MV	3.95
7631CCPE	16	CMOS Tri Op Amp Comp.	10MV	5.35
7641CCPD	14	CMOS Quad Op Amp Comp.	10MV	7.50
7642CCPD	14	CMOS Quad Op Amp Comp.	10MV	7.50
7660CPA	8	Voltage Converter		2.95
8038CCPD	14	Waveform Generator		3.95
8048CCPE	16	Monolithic Logarithmic Amp		16.95
8069CCQ		50ppm Band—GAP Volt Ref. Diode		2.50
8211CPA	8	Volt Ref/Indicator		2.95
8212CPA	24	Volt Ref/Indicator		2.95
30009		**1983 Intersil Data Book (1356 pages)**		**$9.95**

74C—C/MOS

74C00	14	.35				74C221	16	1.95
74C02	14	.35				74C240	20	1.95
74C04	14	.29	74C95	14	1.39	74C244	20	1.95
74C08	14	.35	74C107	14	.89	74C373	20	2.49
74C10	14	.35	74C151	16	2.49	74C374	20	2.49
74C14	14	.59	74C154	24	3.49	74C901	14	.59
74C20	14	.35	74C157	16	2.25	74C903	14	.59
74C30	14	.35	74C160	16	1.19	74C906	14	.59
74C32	14	.39	74C161	16	1.19	74C911	28	8.95
74C42	16	1.39	74C162	16	1.19	74C912	28	8.95
74C48	16	1.95	74C163	16	1.19	74C915	18	1.19
74C73	14	.79	74C164	14	1.49	74C917	28	8.95
74C74	14	.69	74C173	16	.79	74C922	18	4.49
74C85	16	1.95	74C174	16	1.19	74C923	20	4.95
74C86	14	.39	74C175	16	1.19	74C925	16	5.95
74C89	16	5.95	74C192	16	1.49	74C926	18	5.95
74C90	14	1.19	74C193	16	1.69	80C95	16	.39
74C93	14	1.19	74C195	16	1.39	80C97	16	.39

NEW PRODUCT! 74HC High Speed CMOS

74HC00	14	.75	74HC138	16	1.49	74HC243	14	2.79
74HC02	14	.75	74HC139	16	1.49	74HC251	16	1.19
*74HCU04	14	.75	74HC147	16	1.19	74HC266	14	.99
74HC08	14	.75	74HC151	16	1.19	74HC280	14	4.95
74HC10	14	.75	74HC157	16	1.19	74HC373	20	3.95
74HC20	14	.75	74HC160	16	1.79	74HC374	20	3.95
74HC27	14	.75	74HC161	16	1.79	74HC533	20	3.95
74HC74	14	.99	74HC164	14	1.79	74HC534	20	3.95
74HC75	16	.99	74HC174	16	1.39	74HC4075	14	.75
74HC86	14	.99	74HC175	16	1.39	74HC4538	16	2.95
74HC109	16	1.38	74HC242	14	2.79	74HC4543	16	4.95

*74HCU04 is unbuffered. All others are buffered. **Send $.30 for Data Sheet.**

NEW Programmable Array Logic (PALS)

Part No.	**Pins	Function	Price
PAL10H8	20	Octal 10-Input AND-OR Gate Array (High Output)	$5.95
PAL12H6	20	Hex 12-Input AND-OR Gate Array (High Output)	5.95
PAL14H4	20	Quad 14-Input AND-OR Gate Array (High Output)	5.95
PAL10L8	20	Octal 10-Input AND-OR-Invert Gate Array (Low Output)	5.95
PAL12L6	20	Hex 12-Input AND-OR-Invert Gate Array (Low Output)	5.95
PAL14L4	20	Quad 14-Input AND-OR-Invert Gate Array (Low Output)	5.95
PAL16L8	20	Octal 16-Input AND-OR-Invert Gate Array (Low Output)	9.95
PAL16R8	20	Octal 16-Input Register AND-OR Gate Array	9.95
PAL16R6	20	Hex 16-Input Register AND-OR Gate Array	9.95
PAL16R4	20	Quad 16-Input Register AND-OR Gate Array	9.95
30012		**1982 National PAL Data Book (175 pages)**	**$5.95**

LINEAR

TL071CP	8	.79				NE570N	16	3.95
TL072CP	8	1.39				LM703CN	8	1.19
TL074CN	14	1.95	LM340K-15		1.35	LM709N	14	.49
TL081CP	8	.59	LM340T-5		.79	LM710N	14	.69
TL082CP	8	1.19	LM340T-12		.79	LM711N	14	.79
TL084CN	14	1.95	LM340T-15		.79	LM723N	14	.55
LM301CN	8	.35	LM348N	14	.99	LM733N	14	1.00
LM302H		1.95	LM350K		4.95	LM739N	14	1.95
LM304H		1.95	LF355N	8	1.10	LM741CN	8	.35
LM305H		.99	LF356N	8	1.10	LM747N	14	.69
LM307CN	8	.45	LM370N	14	4.49	LM748N	8	.59
LM308CN	8	.69	LM373N	14	3.95	LM1310N	14	1.49
LM309K		1.25	LM377N	14	1.95	LM1458CN	8	.59
LM310CN	8	1.75	LM380N	14	.89	LM1488N	14	.69
LM311CN	8	.69	LM381N	14	1.79	LM1489N	14	.69
LM312H		2.49	LM382N	14	1.39	LM1496N	14	1.95
LM317T		1.19	LM384N	14	1.79	LM1800N	16	1.49
LM317K		3.95	LM386N-3	8	.89	LM1889N	18	1.95
LM318CN	8	1.95	TL494CN	16	2.95	LM1896N	14	2.95
LM319N	14	1.95	TL496CP	8	1.19	LM2002T		1.49
LM320K-5		1.35	NE510A	14	4.95	LM3189N	16	1.59
LM320K-12		1.35	NE529A	14	2.95	LM3900N	14	.59
LM320K-15		1.35	NE531V	8	2.95	LM3905CN	8	1.19
LM320T-5		.89	NE536H		8.95	LM3909N	8	.99
LM320T-12		.89	NE540H		4.95	LM3914N	18	3.49
LM320T-15		.89	NE544N	14	2.95	LM3915N	18	3.49
LM323K		5.95	NE550A	14	1.95	LM3916N	18	3.49
LM324N	14	.59	NE555V	8	.35	RC4136N	14	1.25
LM337T		1.95	LM556N	14	.69	RC4151NB	8	1.95
LM338K		6.95	NE564N	16	2.95	ICL8038B	14	3.95
LM339N	14	.69	LM565N	14	1.19	LM13080N	8	1.19
LM340K-5		1.35	LM566CN	8	1.49	LM13600N	16	1.19
LM340K-12		1.35	LM567V	8	.89	MORE AVAILABLE		

CONNECTORS

DB25 — D Subminiature (meets RS232)

Part No.	Description	Price
DE9P	9 Pin Plug	$1.79
DE9S	9 Pin Socket	1.95
DA15P	15 Pin Plug	1.95
DA15S	15 Pin Socket	2.95
DB25P	**25 Pin Plug (Meets RS232)**	**2.49**
DB25S	**25 Pin Socket (Meets RS232)**	**3.25**
DB25P-831	25 Pin Right Angle Plug	4.95
DB25S-831	25 Pin Right Angle Socket	5.25
DC37P	37 Pin Plug	4.95
DC37S	37 Pin Socket	5.95
DD50P	50 Pin Plug	5.95
DD50S	50 Pin Socket	6.95
Accessories		
DE-9H	Hood for DE-9 Series Connectors	$1.19
DA-15H	Hood for DA-15 Series Connectors	1.29
DB25H	Hood for DB25 Series Connectors	1.25
DC37H	Hood for DC37 Series Connectors	1.39
DD50H	Hood for DD50 Series Connectors	1.49
D20418-2	2 screws for mtg. connectors to a panel	.79

Solder Eyelet/Wire Wrap Edge Card

Part No.	Cnts.	Sp.	Description	Price
15/30SE	15/30	.156	Solder Eyelet	$1.79
18/36SE	18/36	.156	Solder Eyelet	1.95
22/44SE	22/44	.156	Solder Eyelet	2.49
22/44PC	22/44	.156	PC type (no mtg. ears)	.99
50/100SE	50/100	.125	Solder Eyelet	9.95
22/44WW	22/44	.156	Wire Wrap - Level 3	4.95
67031-5	22/44	.156	WW (Pins .0625x.03x.75)	3.95
R-681-1	50/100	.125	Wire Wrap - Level 3	7.95
R-681-2	50/100	.125	Wire Wrap - Level 1	6.95

RF Coaxial Connectors

Part No.	Description	Price
PL259	UHF Plug	$ .89
SO239	UHF Panel Receptacle	.69
PL258	UHF Straight Adapter	.89
UG175/U	UHF Reducing Adapter	.49
UG88/U	BNC Plug	1.49
UG89/U	BNC Jack	1.69
UG306/U	BNC Angle Adapter	2.49
UG260/U	BNC Plug	1.49
UG1094/U	BNC Bulkhead Receptacle	.89

IC SOCKETS

For Socket Required, See Column After The IC Part No.

LOW PROFILE (TIN) SOCKETS

	1-9	10-99	100-999
8 pin LP	.16	.14	.13
14 pin LP	.17	.15	.14
16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.46	.43

— Soldertail Standard Tin & Gold Also Available —

WIRE WRAP (GOLD) SOCKETS LEVEL #3

	1-9	10-99	100-999
8 pin WW	.49	.45	.42
10 pin WW	.65	.62	.59
14 pin WW	.65	.62	.59
16 pin WW	.69	.65	.61
18 pin WW	.89	.85	.79
20 pin WW	1.09	1.05	.99
22 pin WW	1.25	1.19	1.15
24 pin WW	1.29	1.23	1.18
28 pin WW	1.59	1.50	1.45
36 pin WW	1.85	1.75	1.69
40 pin WW	1.99	1.89	1.79

CAPACITOR CORNER

50 VOLT CERAMIC DISC CAPACITORS

Value	1-9	10-99	100+	Value	1-9	10-99	100+
10 pf	.08	.06	.05	.001µF	.08	.06	.05
22 pf	.08	.06	.05	.0047µF	.08	.06	.05
47 pf	.08	.06	.05	.01µF	.08	.06	.05
100 pf	.08	.06	.05	.022µF	.09	.07	.06
220 pf	.08	.06	.05	.047µF	.09	.07	.06
470 pf	.08	.06	.05	.1µF	.15	.12	.10

MINI. ALUMINUM ELECTROLYTIC CAPACITORS

Axial	1-99	100-499	500+	Radial	1-99	100-499	500+
.47/50V	.16	.14	.10	.47/25V	.15	.13	.12
1.0/50V	.19	.16	.12	.47/50V	.16	.14	.13
3.3/50V	.17	.15	.11	1.0/16V	.15	.13	.12
4.7/25V	.18	.15	.11	1.0/25V	.16	.14	.13
10/25V	.18	.15	.11	1.0/50V	.17	.15	.14
10/50V	.19	.16	.12	4.7/16V	.15	.13	.12
22/25V	.19	.16	.12	4.7/25V	.16	.14	.13
22/50V	.24	.20	.18	4.7/50V	.17	.15	.14
47/25V	.25	.21	.19	10/16V	.15	.13	.12
47/50V	.29	.25	.23	10/25V	.16	.14	.13
100/25V	.28	.24	.22	10/50V	.17	.15	.14
100/50V	.41	.37	.34	47/50V	.25	.21	.19
220/25V	.39	.34	.33	100/16V	.21	.17	.14
220/50V	.49	.45	.41	100/25V	.25	.23	.21
470/25V	.54	.49	.45	100/50V	.37	.34	.31
1000/16V	.79	.69	.61	220/16V	.25	.21	.19
2200/16V	.89	.79	.69	470/25V	.35	.31	.27

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LM301	.34	LM340 (see 7800)		NE558	1.50	LM1489	.69
LM301H	.79	LM348	.99	NE561	19.95	LM1496	.85
LM307	.45	LM350K	4.95	NE564	2.95	LM1558H	3.10
LM308	.69	LM350T	4.60	LM565	.99	LM1800	2.37
LM308H	1.15	LM358	.69	LM566	1.49	LM1812	8.25
LM309H	1.95	LM359	1.79	LM567	.89	LM1830	3.50
LM309K	1.25	LM376	3.75	NE570	3.95	LM1871	5.49
LM310	1.75	LM377	1.95	NE571	2.95	LM1872	5.49
LM311	.64	LM378	2.50	NE592	2.75	LM1877	3.25
LM311H	.89	LM379	4.50	LM703	.89	LM1889	1.95
LM312H	1.75	LM380	.89	LM709	.59	LM1896	1.75
LM317K	3.95	LM380N-8	1.10	LM710	.75	LM2877	2.05
LM317T	1.19	LM381	1.60	LM711	.79	LM2878	2.25
LM318	1.49	LM382	1.60	LM723	.49	LM2900	.85
LM318H	1.59	LM383	1.95	LM723H	.55	LM2901	1.00
LM319H	1.25	LM384	1.95	LM733	.98	LM3900	.59
LM319	1.25	LM386	.89	LM741N-8	.35	LM3905	1.25
LM320 (see 7900)		LM387	1.40	LM741N-14	.35	LM3909	.98
LM322	1.65	LM389	1.35	LM741H	.40	LM3911	2.25
LM323K	4.95	LM390	1.95	LM747	.69	LM3914	3.95
LM324	.59	LM392	.69	LM748	.59	LM3915	3.95
LM329	.65	LM394H	4.60	LM1014	1.19	LM3916	3.95
LM331	3.95	LM399H	5.00	LM1303	1.95	MC4024	3.95
LM334	1.19	NE531	2.95	LM1310	1.49	MC4044	4.50
LM335	1.40	NE536	6.00	MC1330	1.69	RC4136	1.25
LM336	1.75	NE555	.34	MC1349	1.89	RC4151	3.95
LM337K	3.95	NE556	.65	MC1350	1.19	LM4250	1.75
LM337T	1.95	NE558	1.50	MC1358	1.69	LM4500	3.25
LM338K	6.95	NE555	.34	LM1414	1.59	LM13080	1.29
LM339	.99	NE556	.65	LM1458	.59	LM13600	1.49
				LM1488	.69	LM13700	1.49

H = TO-5 CAN T = TO-220 K = TO-3

RCA

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CA 3039	1.29	CA 3083	1.55
CA 3046	1.25	CA 3086	.80
CA 3059	2.90	CA 3089	2.99
CA 3060	2.90	CA 3096	3.49
CA 3065	1.75	CA 3130	1.30
CA 3080	1.10	CA 3140	1.15
CA 3081	1.65	CA 3146	1.85

TI

TL494	4.20	75365	1.95
TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
		75494	.89

BI FET

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TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
TL082	1.19	LF355	1.10
TL083	1.19	LF356	1.10
		LF357	1.40

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7808T	.89	7908T	.99
7812T	.89	7912T	.99
7815T	.89	7915T	.99
7824T	.89	7924T	.99
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	7915K	1.49
7824K	1.39	7924K	1.49
78L05	.69	79L05	.79
78L12	.69	79L12	.79
78L15	.69	79L15	.79
78H05K	9.95	LM323K	4.95
78H12K	9.95	UA78S40	1.95

T = TO-220 K = TO-3
L = TO-92

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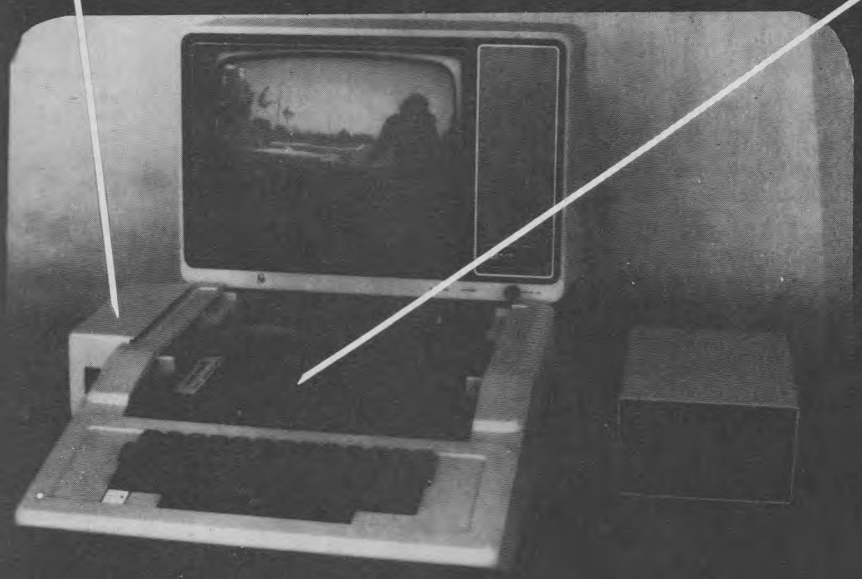

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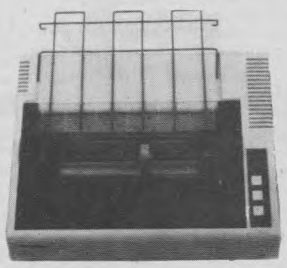

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2112	256 x 4 (450ns)	2.99
2114	1024 x 4 (450ns)	8/14.95
2114L-4	1024 x 4 (450ns) (LP)	8/15.25
2114L-3	1024 x 4 (300ns) (LP)	8/15.45
2114L-2	1024 x 4 (200ns) (LP)	8/15.95
2147	4096 x 1 (55ns)	4.95
TMS4044-4	4096 x 1 (450ns)	3.49
TMS4044-3	4096 x 1 (300ns)	3.99
TMS4044-2	4096 x 1 (200ns)	4.49
MK4118	1024 x 8 (250ns)	9.95
TMM2016-200	2048 x 8 (200ns)	4.15
TMM2016-150	2048 x 8 (150ns)	4.95
TMM2016-100	2048 x 8 (100ns)	6.15
HM6116-4	2048 x 8 (200ns) (cmos)	4.95
HM6116-3	2048 x 8 (150ns) (cmos)	5.95
HM6116-2	2048 x 8 (120ns) (cmos)	8.95
HM6116LP-4	2048 x 8 (200ns) (cmos)(LP)	6.95
HM6116LP-3	2048 x 8 (150ns) (cmos)(LP)	8.95
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5v = Single 5 Volt Supply

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PE-24T	X	9	6,700	175.00
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PR-125T	X	16	15,000	349.00
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6.144	3.95
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10.7836	3.95
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8741	39.95
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8202	29.95
8203	39.95
8205	3.50
8212	1.80
8214	3.85
8216	1.75
8224	2.25
8226	1.80
8228	3.49
8237	19.95
8238	4.49
8243	4.45
8250	10.95
8251	4.49
8253	6.95
8253-5	7.95
8255	4.49
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8257	7.95
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8284	5.50
8286	6.50
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6820	4.95
6821	3.25
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	14.95
6847	12.25
6850	3.45
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6860	9.95
6862	11.95
6875	6.95
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68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
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68B00 = 2 MHZ

6500

1 MHZ

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6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

2 MHZ

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6551A	12.95

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74LS01	.25	74LS90	.55	74LS170	1.49	74LS324	1.75
74LS02	.25	74LS91	.89	74LS173	.69	74LS352	1.29
74LS03	.25	74LS92	.55	74LS174	.55	74LS353	1.29
74LS04	.24	74LS93	.55	74LS175	.55	74LS363	1.35
74LS05	.25	74LS95	.75	74LS181	2.15	74LS364	1.95
74LS08	.28	74LS96	.89	74LS189	8.95	74LS365	.49
74LS09	.29	74LS107	.39	74LS190	.89	74LS366	.49
74LS10	.25	74LS109	.39	74LS191	.89	74LS367	.45
74LS11	.35	74LS112	.39	74LS192	.79	74LS368	.45
74LS12	.35	74LS113	.39	74LS193	.79	74LS373	.99
74LS13	.45	74LS114	.39	74LS194	.69	74LS374	.99
74LS14	.59	74LS122	.45	74LS195	.69	74LS377	1.39
74LS15	.35	74LS123	.79	74LS196	.79	74LS378	1.18
74LS20	.25	74LS124	2.90	74LS197	.79	74LS379	1.35
74LS21	.29	74LS125	.49	74LS221	.89	74LS385	1.90
74LS22	.25	74LS126	.49	74LS240	.95	74LS386	.45
74LS26	.29	74LS132	.59	74LS241	.99	74LS390	1.19
74LS27	.29	74LS133	.59	74LS242	.99	74LS393	1.19
74LS28	.35	74LS136	.39	74LS243	.99	74LS395	1.19
74LS30	.25	74LS137	.99	74LS244	.99	74LS399	1.49
74LS32	.29	74LS138	.55	74LS245	1.49	74LS424	2.95
74LS33	.55	74LS139	.55	74LS247	.75	74LS447	.37
74LS37	.35	74LS145	1.20	74LS248	.99	74LS490	1.95
74LS38	.35	74LS147	2.49	74LS249	.99	74LS624	3.99
74LS40	.25	74LS148	1.35	74LS251	.59	74LS668	1.69
74LS42	.49	74LS151	.55	74LS253	.59	74LS669	1.89
74LS47	.75	74LS153	.55	74LS257	.59	74LS670	1.49
74LS48	.75	74LS154	1.90	74LS258	.59	74LS674	9.65
74LS49	.75	74LS155	.69	74LS259	2.75	74LS682	3.20
74LS51	.25	74LS156	.69	74LS260	.59	74LS683	3.20
74LS54	.29	74LS157	.65	74LS266	.55	74LS684	3.20
74LS55	.29	74LS158	.59	74LS273	1.49	74LS685	3.20
74LS63	1.25	74LS160	.69	74LS275	3.35	74LS688	2.40
74LS73	.39	74LS161	.65	74LS279	.49	74LS689	3.20
74LS74	.35	74LS162	.69	74LS280	1.98	74LS783	24.95
74LS75	.39	74LS163	.65	74LS283	.69	81LS95	1.49
74LS76	.39	74LS164	.69	74LS290	.89	81LS96	1.49
74LS78	.49	74LS165	.95	74LS293	.89	81LS97	1.49
74LS83	.60	74LS166	1.95	74LS295	.99	81LS98	1.49
74LS85	.69	74LS168	1.75	74LS298	.89	25LS2521	2.80
						25LS2569	4.25

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14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
ST = SOLDERTAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
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7403	.19	74142	2.95
7404	.19	74143	2.95
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7406	.29	74147	1.75
7407	.29	74148	1.20
7408	.24	74150	1.35
7409	.19	74151	.55
7410	.19	74152	.65
7411	.25	74153	.55
7412	.30	74154	1.25
7413	.35	74155	.75
7414	.49	74156	.65
7416	.25	74157	.55
7417	.25	74159	1.65
7420	.19	74160	.85
7421	.35	74161	.69
7422	.35	74162	.85
7423	.29	74163	.69
7425	.29	74164	.85
7426	.29	74165	.85
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7438	.29	74175	.89
7440	.19	74176	.89
7442	.49	74177	.75
7443	.65	74178	1.15
7444	.69	74179	1.75
7445	.69	74180	.75
7446	.69	74181	2.25
7447	.69	74182	.75
7448	.69	74184	2.00
7450	.19	74185	2.00
7451	.23	74186	18.50
7453	.23	74190	1.15
7454	.23	74191	1.15
7460	.23	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.33	74196	.79
7475	.45	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7485	.59	74248	1.85
7486	.35	74249	1.95
7489	2.15	74251	.75
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74121	.29	74368	.65
74122	.45	74376	2.20
74123	.49	74390	1.75
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74126	.45	74425	3.15
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4021	.79	74C14	.59
4022	.79	74C20	.35
4023	.29	74C30	.35
4024	.65	74C32	.39
4025	.29	74C42	1.29
4026	1.65	74C48	1.99
4027	.45	74C73	.65
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4049	.35	74C154	3.25
4050	.35	74C157	1.75
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4053	.79	74C161	1.19
4060	.89	74C162	1.19
4066	.39	74C163	1.19
4068	.39	74C164	1.39
4069	.29	74C165	2.00
4070	.35	74C173	.79
4071	.29	74C174	1.19
4072	.29	74C175	1.19
4073	.29	74C192	1.49
4075	.29	74C193	1.49
4076	.79	74C195	1.39
4078	.29	74C200	5.75
4081	.29	74C221	1.75
4082	.29	74C373	2.45
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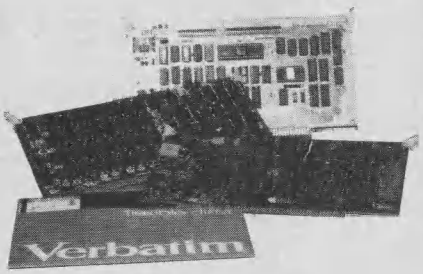

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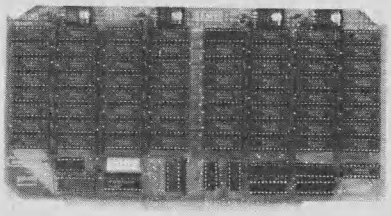

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- 170 millisecond random average access time, reduceable to 95 ms via a simple software algorithm
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- Addresses 1 to 16 heads
- Addresses an infinite number of tracks
- Contains its own on-board microprocessor — Signetics 8X300
- 24-bit address burst DMA transfers
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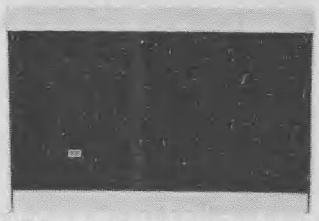

The DMAHDC has been designed for expansion. One to four drives can be attached directly and controlled. One to sixteen drive heads may be addressed. Any number of tracks may be specified during the seek routine by specifying one to two hundred and fifty-six tracks one or more times. Each of the expansion abilities prepair the user to upgrade his system as technology advances to additional platters and tracks.

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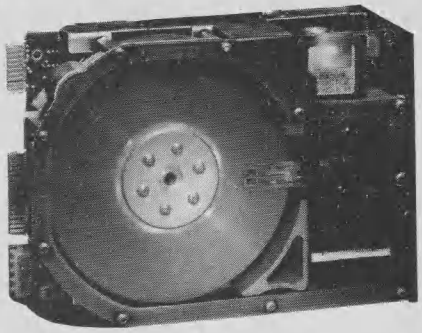
KKMDSDMAM5	Software supplied on 8" IBM3740 disk with blank I/O and INSTALL program
KKMDSDMAM52B	Software configured for Morrow DJ/2B controller and Mult I/O as console
KKMDSDMAM5DMA	Software configured for Morrow DJ/DMA controller and Mult I/O as console



KKMDSDMAM55S	Software supplied on 5¼" soft sector (IBM/Cromemco disk w/blank I/O and INSTALL program	
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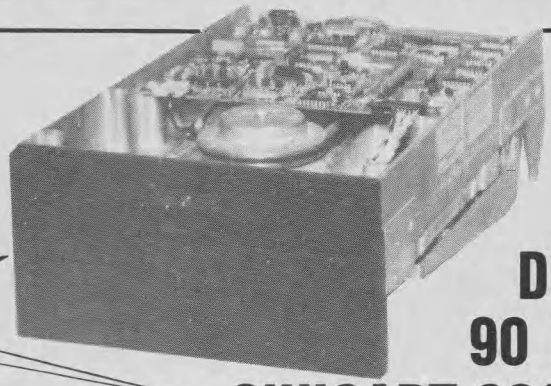

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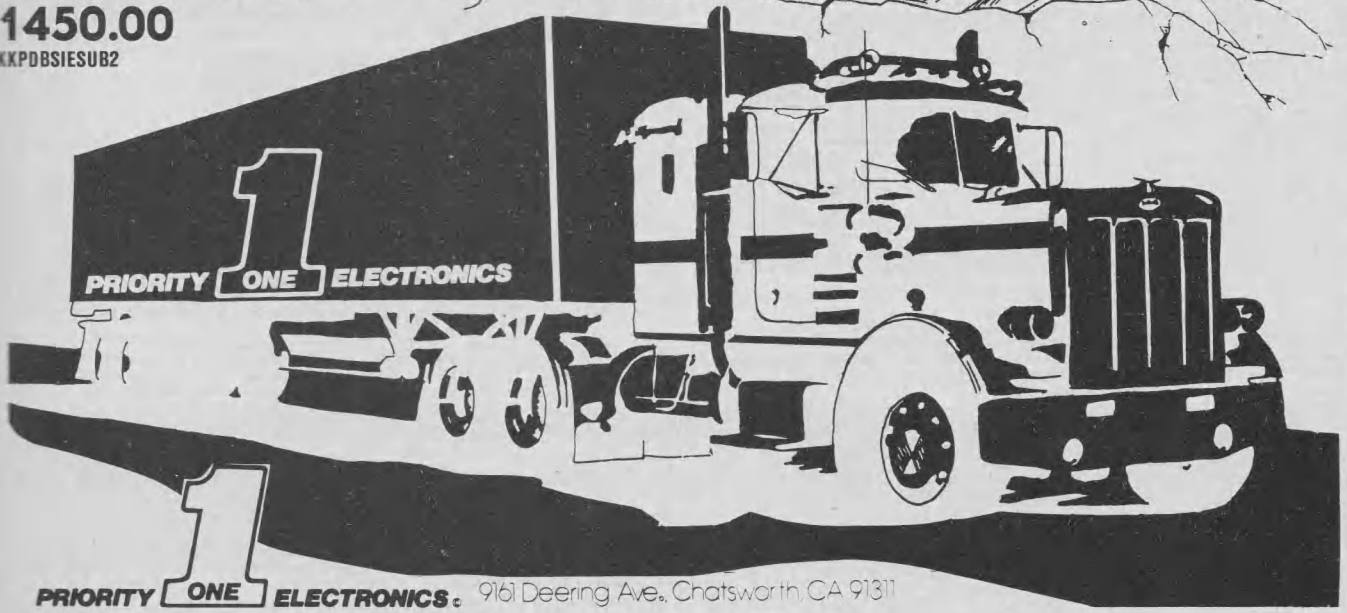

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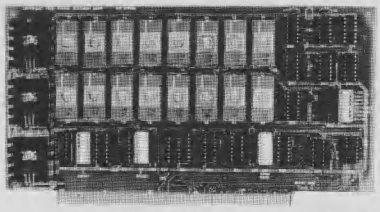

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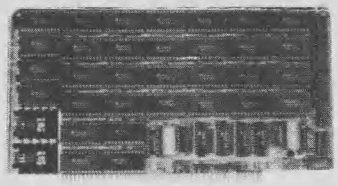

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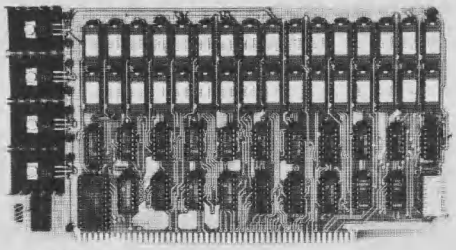

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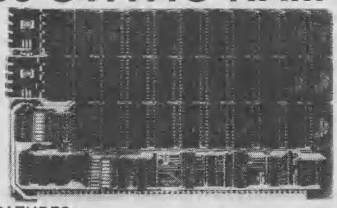

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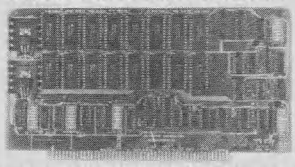

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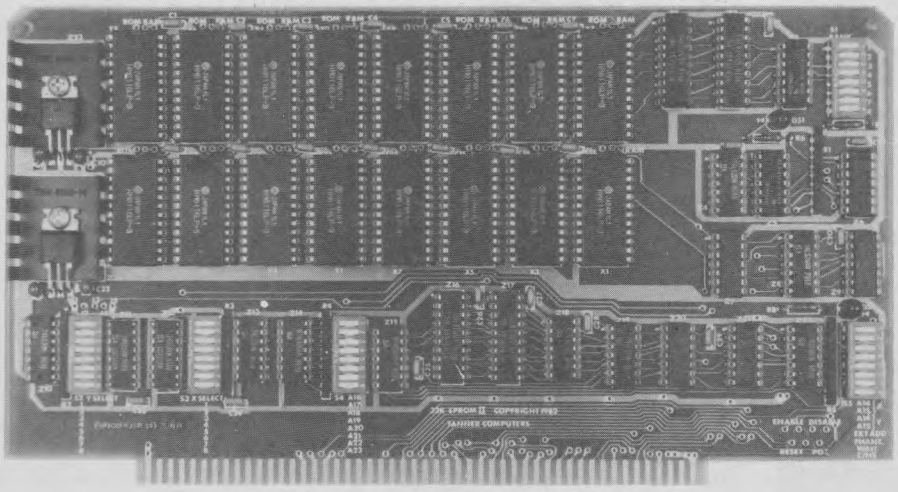

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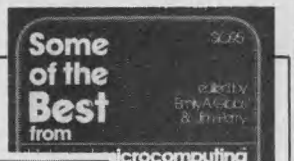

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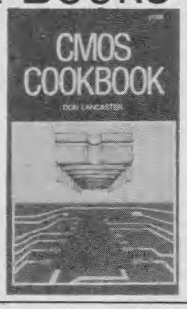

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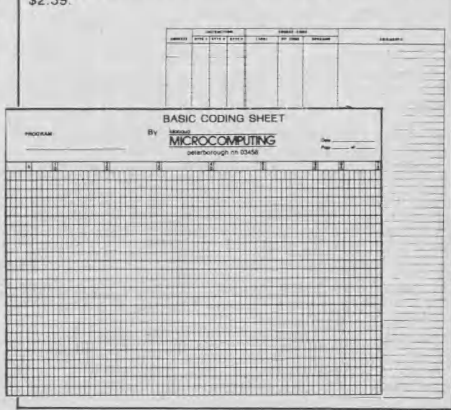

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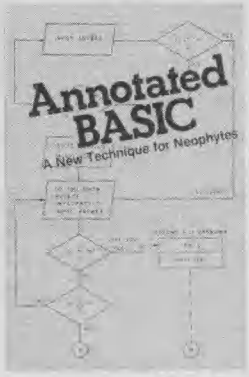

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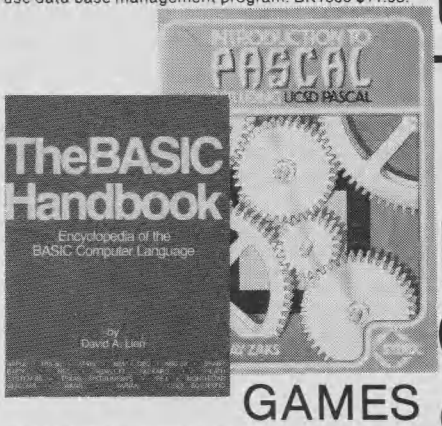

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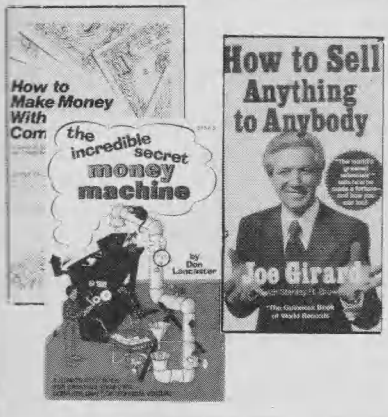

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Basex is No Joke
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My Micro Speaks Basex (And Loves It)

Paul Warme
Hayden Book Company, Inc., 1981
50 Essex St.
Rochelle Park, NJ 07662
Softcover, 164 pp., $9.95

So what in the world is Basex? Is it one of those joke "languages" like Foul and Filthy?

No, Basex is for real, and Paul Warme's book, *My Micro Speaks Basex (And Loves It)*, is an introductory text to this new, relatively simple language.

Author Warme (who developed Basex) takes a breezy, conversational approach to his topic. The book flows along in a chatty sort of way, building in difficulty as it progresses.

Warme goes to great lengths to give thorough and detailed descriptions of all of his language's attributes, and down-to-earth program samples are liberally sprinkled throughout to give the reader a chance to see what Basex can do in action. Warme provides in-depth discussion on the control of program flow, inputs and outputs, memory load and store commands, program editing, text string handling, subroutines and graphics—the whole ball of wax.

As for the language itself, Basex has some intriguing benefits. Warme claims that a typical Basex program can run ten times faster than its Basic equivalent (great for games like chess and checkers, and most graphics applications). It also features a simplified program entry method that should, at least theoretically, result in a reduced memory requirement.

But Basex has its drawbacks, too, and they are considerable. The language, for instance, works only with whole integers in the range −32768 to 32767, and it's impossible to use for trigonometric functions (sin, cos, tan) or noninteger work (SQR, EXP, LOG).

Another disadvantage of Basex, as Warme notes, is the requirement to break down arithmetic expressions into single operations—so B*C+D would have to be handled as MLT B*C; ADD A+D. Kind of messy. Add to all of this the fact that the book is almost exclusively devoted to 8080 and Z-80 microprocessors, and Basex quickly loses much of its appeal.

Still, Basex looks like an interesting beginner's language if you don't ask too much from it. The only problem is: how many beginners are going to be willing to tackle an offbeat language like this *after* learning Basic? Sure, a newcomer to computing *could* learn Basex before being introduced to Basic, but that doesn't seem very likely, given Basic's widespread popularity. One would be better off mastering Basic, then learning a higher-level language for speed.

Basex is an interesting little language—and the book is fun on an intellectual level, but it's hard to see how it can become anything but an intellectual curiosity.

John Edwards
Glendale, NY

8080/Z-80 Assembly Language

Alan R. Miller
John Wiley & Sons, Inc., 1981
605 Third Avenue
New York, NY 10158
Paperback, 318 pp., $9.95

Alan Miller has been working with microcomputers since the early days of the Altair. As far back as 1976 he had his students performing meaningful calculations using an 8K version of Basic. And that was before floppy disks.

When floppies became available, Miller and his students built their own disk controller, independently discovering that floppy transfer rates are faster than an 8080 can keep up with in a "test status, loop on not ready" mode.

The reason for this background information is to assure the reader that Miller knows his subject intimately. Just about everything you'll ever want to know about assembly language programming for systems or smart controllers is contained in *8080/Z-80 Assembly Language*. And with its complete table of contents and index, you'll be able to find the information easily.

In the preface, Miller states that his goal with *8080/Z-80 Assembly Language* is to provide a complete reference book, and to demonstrate useful assembly language techniques. It isn't billed as a self-learning text for beginners, but it should be acquired by all beginners as soon as they have taken their first programming steps.

The reason for this is that the book contains examples of just about everything you will want to do when you start writing your first programs. And the examples are given for both the 8080 instruction set and the more powerful Z-80 superset. Having this book handy will relieve you of the necessity for re-inventing lots of wheels.

Since the book is not intended as an introductory text, some of the explanations of the example techniques are less than completely detailed, but all program examples are illustrated with program listings reproduced from actual computer printouts (for confidence) and those listings are heavily commented. It would be possible to learn 8080 or Z-80 programming by using this book in conjunction with the respective CPU reference manual. A lot of us (including Miller) started with less.

In the nit-picking department, the book is flawed by too many typos ("Lifeboart Associates"!) and more than a couple of misconceptions (CP/M was not developed for S-100 bus systems; PSW does not refer to the flag register alone . . .) but

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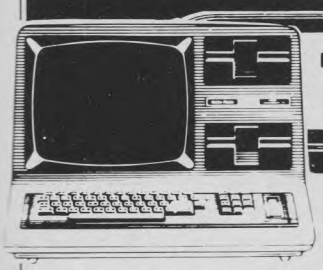

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these do not detract from the accuracy or usefulness of the real meat of the text.

A more serious shortcoming is that too much of the material is hardware-specific to the author's own computer. Some of the operations in his examples simply will not work with some non-S-100 bus systems. Somewhat alleviating this situation is the fact that the preface does detail exactly what hardware was used to produce the sample programs. If they don't work for you, it could be due to differences in hardware. The less experienced reader might have a little trouble figuring this out.

But considered as a reference work for the serious programmer, and as a second text for the beginner, this book is a gold mine of useful program examples and reference tables in its ten appendixes. With its presentation of isolated examples of programming tricks, as well as listings of complete monitor programs for both of the most popular microprocessors, it is a reference work you'll use for years to come. I only wish I'd had a copy back in 1976.

Ken Barbier
Borrego Springs, CA

Don't! (Or How To Care For Your Computer)

Rodnay Zaks
Sybex, 1981
2344 Sixth St.
Berkeley, CA 94710
Paperback, 244 pp., $11.95

The glib salesman at your local computer emporium is likely to turn green at the sight of *Don't! (Or How To Care For Your Computer)*. After all, he assured you that microcomputers are not only reliable, but they're foolproof too. So why would someone devote an entire 244-page book to the subject of computer care?

Starting with the premise that most computer problems are the result of operator error, *Don't!* goes on to offer suggestions for keeping your system healthy and definitions you'll need to identify the source of your problems. After that brief but helpful tour, *Don't!* jumps into the specifics of caring for your system's individual parts.

Why would someone devote an entire 244-page book to the subject of computer care?

What better way to begin than with a chapter on the floppy disk? Here readers will find the first of the book's numerous horror stories. Once the author has you frightened, he starts to educate you about the inner workings of disk drives.

The same sort of behind-the-scenes explanations are found in chapters covering hard disks, CRTs, printers, tape units, software and the computer itself. There's even a short chapter devoted to the care of documentation.

All of this doesn't leave you feeling anxious to attack your computer's ills with a soldering iron and pliers; instead the emphasis is on preventive maintenance. Author Rodnay Zaks also includes chapters on how to design a special computer room and on computer security, although those topics seem a bit far-fetched for the home or small business user.

The text in *Don't!* is easy to read and free of jargon and is supplemented by many humorous yet educational drawings and cartoons.

In handling your computer system, you can, as the author says, "learn through experience." Or you can take advantage of other people's hard-earned wisdom via *Don't!*. Regardless of what the friendly salesman says, take a copy of *Don't!* home along with that new computer.

Timothy Daniel
Hancock, NH

UCSD Pascal: A Beginner's Guide to Programming Microcomputers

J.N.P. Hume and R. C. Holt
Reston Publishing Company, 1982
11480 Sunset Hills Road
Reston, VA 22090
Softcover, 346 pp., $12.95

UCSD Pascal has become one of the most popular languages available for microcomputers. Several reasons account for its widespread acceptance, with portability and ease of use ranking near the top of the list.

With such popularity, it's easy to see why there are so many books written about Pascal; a large proportion of these touch on some aspect of the UCSD version. Now there's one written for the person who has just brought up UCSD Pascal on his or her computer and is ready to begin learning to program for the first time.

Authors J.N.P. Hume and R.C. Holt take the approach that it's better to introduce a series of Pascal Subsets, which they call PS/1, PS/2, PS/3 and so on, and allow the new programmer to become fully familiar with these limited subsets before pressing on to more complex concepts.

They spend the first two chapters describing their approach and introducing the user to the most basic concepts of computing. So before asking the reader to write anything on the computer, they cover the language, the components of a computer and the way input/output is handled.

Each chapter includes a summary of the points covered, and most chapters include glossaries of terms used. Each chapter also includes exercises that the reader can use to test his or her progress. Unfortunately, there are no solutions provided, but in many cases there is no "right" answer and the only true test is whether the reader's solution works.

Chapter 3 offers the first real look at programming in Pascal, and it's a simple example of calculation. Programming is still discussed from a theoretical perspective as the reader is not yet instructed to write a program on the computer. This chapter is PS/1 and deals with the types of information that Pascal can handle (characters, numbers, character strings and expressions).

To someone using a computer for the first time, chapter 4 can be the most helpful chapter. It introduces the basic UCSD command and covers briefly what Ken Bowles covers in great detail in his *Beginner's Guide for the UCSD Pascal System*. (Bowles' book is not for the beginner to Pascal or to computers, but it contains a wealth of information on the use of the UCSD system. Hume and Holt spend more time discussing Pascal programming, but less on the details of the system.) By the time the reader finishes chapter 4, he or she will have written, run and saved a Pascal program file, and a major conceptual and psychological hurdle will have been leaped.

From this point on, the pace accelerates. Chapter 5 introduces another subset, PS/2, which deals with constants, variables and assignments. Tracing is covered, as is program execution, data input and the conversion of integer num-

bers to real numbers.

Chapter 6, PS/3, covers control flow, including loops, conditions, Boolean variables and branching, and chapter 7 builds the concept of structured programming. Most of the reader's time will be spent learning how to structure control flow, an ability that has tended to set Pascal apart from other languages—at least in the minds of many programmers and instructors.

The authors favor the use of flowcharts as an aid toward achieving structured flow of programs, but do not spend much time on this aspect of programming. While the reader certainly won't learn flowcharting from this book, he or she will come away more aware of its benefits.

The eighth chapter presents PS/4 arrays. Chapter 9, with PS/5, covers character strings in detail and introduces file-handling with the reading of lines and EOF (End Of Line). Since UCSD Pascal handles strings a little differently than standard Pascal, chapter 9 is critical for the UCSD Pascal user, and contains information that, unlike other chapter contents, may not be directly useful in a non-UCSD system.

A brief discussion of ways to structure the attack on a specific program is included in chapter 10. While far from exhaustive, it's a fair introduction to a difficult concept. The authors present the idea of top-down programming and stepwise refinement and suggest ways to apply these ideas, but don't go much further than that. The reader would need to refer to more detailed texts to pursue this subject.

A Beginner's Guide is an outstanding introduction to both UCSD Pascal and the UCSD system.

Chapter 11 deals with pattern or word recognition and is useful in demonstrating that Pascal can do other things besides number-crunching. The author covers another Pascal Subset, PS/6, which is devoted to subprograms, in chapter 12.

The UCSD graphics package, Turtle Graphics, and more information on the UCSD system commands, especially the editor and the filer, are presented in chapters 13 and 14.

Chapter 15 is a solid introduction to searching and sorting methods, and presents the binary search and the method of sorting by merging. The concept of estimating the efficiency of sorting methods is also covered. Chapters 16 and 17 deal with testing and debugging, but also make one extremely important point that many other texts overlook: Be sure you solved the right problem. In other words, did your program answer the question that was asked? The importance of program specifications cannot be overemphasized.

The final three chapters cover data structures, queues and trees and pointers and buffers. Hume and Holt provide examples of these topics but the reader can expect to do some outside research to come up with a working program. The examples aren't nearly as complete as they should be.

The book closes with scientific calculations as well as the graphing of data and solving of linear and polynomial equations.

I found the book to be an outstanding introduction to both UCSD Pascal and the UCSD system. It does have weaknesses—it won't answer the reader's every question, and a bibliography of reference books suitable for the interested programmer wasn't included. But *UCSD Pascal* is still an excellent value at $12.95.

D.C. Shoemaker
Blacksburg, VA

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MICRO QUIZ

What Does This Program Do?

After the following program is executed, what is the value of C?

(answer on page 173)

```
C = -1
For J = 1 to 12
  K = 0.5*J
  For L = 2*J to 12 - 0.25*J - 0.5*K
    If 2*J ≤ 12 - 0.25*J - 0.5*K then
    C = C + 1
  Next L
Next J
```

CLUB NOTES

Philadelphia Area Computer Society

Users of Apple, Atari, CP/M, IBM, Ohio Scientific, Pascal, PET and TRS-80 are invited to Philadelphia Area Computer Society meetings, which take place on the third Saturday of each month at the LaSalle College Science Building.

Memberships include a subscription to "Data Bus," a monthly newsletter.

For further information, write to P.A.C.S., PO Box 1954, Philadelphia, PA 19105.

"Superletter"

A newsletter and user's group have been developed for Intertec SuperBrain and CompuStar users. The publication, "Superletter," features technical tips, articles, classified ads and reviews.

For information on the user's group and newsletter, write to Albert Abrams, PO Box 3121, Beverly Hills, CA 90212, or call 213-277-2410.

1800 User's Club

The four-year-old 1800 User's Club of Finland now includes more than 500 members.

The club's activities involve program cassettes, hardware and software competitions, monthly meetings in Helsinki, Finland, and a newsletter published ten times per year.

For further information, send a self-addressed envelope to Richard Eller, PO Box 559, 00101 Helsinki 10, Finland.

IBM PC User's Group

The initial meeting of the IBM PC User's Group of Toronto took place in September at the North York Central Branch Library in Willowdale, Ontario. Form and procedure for future activities was outlined at the meeting.

For information on membership and meetings, write to Tony Bagshaw, PO Box 1376, Station B, Downsview, Ontario M3H 5V6.

PLUG User's Group

PLUG, a user's group organized to promote the use of IBM-compatible computer equipment, announced its board of directors: Ed Dugan and David Moskovitz of San Francisco, CA, Jerry Wilson of Rochester, NY, and Charles Collier of Phoenix, AZ.

For information on PLUG, contact James Bunker of the Orsborn Group, 1275 Columbus, San Francisco, CA 94133. 415-928-3600.

Denver Amateur Computer Society

Monthly meetings of the Denver Amateur Computer Society take place on the third Wednesday of each month. This "broad interest club" issues the monthly newsletter "Interrupt," which includes information regarding specific user's groups in Denver.

For details, write to D.A.C.S., PO Box 1235, Englewood, CO 80150.

CSRA Computer Club

The CSRA Computer Club meets on the third Thursday of each month at 7:30 p.m. in the Student Center of the Medical College of (Augusta) Georgia.

For details on the CSRA, a club for computer hobbyists and professionals, write to PO Box 284, Augusta, GA 30903.

The CSRA includes several clubs that also meet in Augusta.

Atari User's Group meets on the first Thursday of each month at Campus Computers (contact Dan Huber, 404-860-2560). TRS-80 User's Group has meetings on the second Thursday of each month at the Medical College of Georgia (contact Steve Larson, 404-733-1232).

Apple User's Group meetings take place on the fourth Thursday of the month at the Computer Shop (contact George Nichols, 404-733-3562). And Heath/Zenith User's Group meets on the fourth Monday of each month at Campus Computers (contact Paul Pennington, 404-860-2934).

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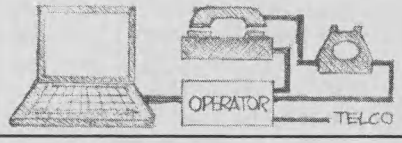

(from page 137)

```
00715 INPUT "";R$:PRINT C$(7);C$(6)
00717 IF LEFT$(R$,1)="D" OR LEFT$(R$,1)="d" THEN 870
00720 IF LEFT$(R$,1)="S" OR LEFT$(R$,1)="s" THEN 780
00730 IF LEFT$(R$,1)="B" OR LEFT$(R$,1)="b" THEN 740
00732 PRINT C$(7);
00734 PRINT "** INVALID SELECTION - PLEASE RE-ENTER (B,S, or D)";C$(6);CHR$(7)
00735 GOTO 710
00736 REM =========      BUY SHARES      =============
00740 GOSUB 900:PRINT C$(6);"Number of Shares Buying ";:INPUT "";R$
00750 R=VAL(R$):IF R<1 THEN PRINT C$(7);"** BAD INPUT!";C$(6):GOTO 820
00760 IF R*T(X)>M(N,1) THEN PRINT C$(7);"Not Enough MONEY!";C$(6):GOTO 820
00770 M(N,X+1)=M(N,X+1)+R:M(N,1)=M(N,1)-(R*T(X)):GOTO 850
00775 REM =========      SELL SHARES     =============
00780 GOSUB 900:PRINT C$(6);"Number of Shares Selling ";:INPUT "";R$
00790 R=VAL(R$):IF R<1 THEN PRINT C$(7);"** BAD INPUT!";C$(6):GOTO 820
00800 IF R<=M(N,X+1) THEN M(N,X+1)=M(N,X+1)-R:M(N,1)=M(N,1)+(R*T(X)):GOTO 850
00805 PRINT C$(7);
00810 PRINT "Not Enough Shares!";C$(6)
00820 PAUSE 1
00840 GOTO 710
00845 REM ==========      UPDATE DISPLAY      =============
00850 GOSUB 950
00860 GOSUB 980:GOTO 710
00870 NEXT N:GOTO 390
00872 REM ======================================================================
00874 REM =         *-*-*       SUBROUTINES       *-*-*
00876 REM ======================================================================
00880 GOSUB 890:FOR J=1 TO 4:GOSUB 1000:NEXT J
00890 RETURN
00900 PRINT C$(6);"Stock Abrev ";:INPUT "";R$:IF LEN(R$)=3 THEN 910
00903 IF LEN(R$)<>2 THEN 940
00906 R$=LEFT$(R$,2)+" "
00910 W1=0:FOR J=0 TO 9:X=J+1
00920 IF R$=MID$(S$,(J*3)+2,3) THEN W1=1:J=9
00930 NEXT J:IF W1=1 THEN PRINT C$(7);C$(6):RETURN
00940 PRINT C$(7);"** INVALID STOCK ABREVIATION - RE-ENTER **";C$(6):GOTO 900
00950 GOSUB 1010:Z=3*(X-1)+2:PRINT MID$(S$,Z,3);"  ";F(X);
00960 Z=7-LEN(STR$(F(X))):R$="      ":PRINT LEFT$(R$,Z);T(X);
00967 Z=6-LEN(STR$(T(X))):PRINT LEFT$(R$,Z);
00970 FOR J=1 TO P:Z=7-LEN(STR$(M(J,X+1))):PRINT M(J,X+1);
00973 IF Z>=1 THEN PRINT LEFT$(R$,Z);
00975 IF J=4 THEN PRINT " "
00976 NEXT J:RETURN
00980 PRINT C$(9);"Cash Totals = ";
00985 R$="      "
00990 FOR J=1 TO P:Z=7-LEN(STR$(M(J,1))):PRINT M(J,1);
00993 IF Z>=1 THEN PRINT LEFT$(R$,Z);
00995 IF J=4 THEN PRINT " "
00996 NEXT J:RETURN
01000 PRINT C$(9);
01010 PRINT C$(3);CHR$(39+X);CHR$(34);:RETURN
01020 FOR N=1 TO P:FOR J=1 TO 10:M(N,1)=M(N,1)+(T(J)*M(N,J+1)):NEXT J:NEXT N
01030 PRINT C$(11);C$(9);"Net Worth =    ";:GOSUB 990:PRINT C$(12);
01035 PRINT C$(7);C$(6);
01040 INPUT "Play Again (Y/N) ";R$
01050 IF LEFT$(R$,1)="N" OR LEFT$(R$,1)="n" THEN 1060
01052 GOSUB 1900
01055 GOTO 340
01060 END
01200 PRINT C$(1);C$(2);C$(4)
01210 FOR I=32 TO 111
01220 PRINT C$(3);CHR$(32);CHR$(I);CHR$(97)
01230 PRINT C$(3);CHR$(34);CHR$(I);CHR$(97)
01240 PRINT C$(3);CHR$(36);CHR$(I);CHR$(97)
01250 PRINT C$(3);CHR$(52);CHR$(I);CHR$(97)
01260 NEXT I
01270 FOR I=32 TO 52
01280 PRINT C$(3);CHR$(I);CHR$(32);CHR$(96)
01290 IF I>34 THEN PRINT C$(3);CHR$(I);CHR$(84);CHR$(96)
01300 PRINT C$(3);CHR$(I);CHR$(111);CHR$(96)
01310 IF I>32 THEN 1340
01320 PRINT C$(3);CHR$(I);CHR$(32);CHR$(102)
01330 PRINT C$(3);CHR$(I);CHR$(111);CHR$(99)
01340 IF I>34 THEN 1390
01350 IF I<34 THEN 1480
01360 PRINT C$(3);CHR$(I);CHR$(32);CHR$(118)
01370 PRINT C$(3);CHR$(I);CHR$(84);CHR$(115)
01380 PRINT C$(3);CHR$(I);CHR$(111);CHR$(116)
01390 IF I>36 THEN 1430
01395 IF I<36 THEN 1480
01400 PRINT C$(3);CHR$(I);CHR$(32);CHR$(118)
01410 PRINT C$(3);CHR$(I);CHR$(84);CHR$(98)
01420 PRINT C$(3);CHR$(I);CHR$(111);CHR$(116)
01430 IF I<>52 THEN 1480
01440 PRINT C$(3);CHR$(I);CHR$(32);CHR$(101)
01450 PRINT C$(3);CHR$(I);CHR$(84);CHR$(117)
01460 PRINT C$(3);CHR$(I);CHR$(111);CHR$(100)
01480 NEXT I
01490 REM ====== PRINT TITLES ========
01495 PRINT C$(6);C$(5)
```

More →

Listing continued.

```
01500 PRINT C$(3);CHR$(33);CHR$(42);"B L A C K   F R I D A Y   S T O C K   ";
01510 PRINT "M A R K E T   G A M E   "
01520 PRINT C$(3);CHR$(35);CHR$(35);"*** Statistics & Financial News ***"
01530 PRINT C$(3);CHR$(35);CHR$(90);"** Stock News **"
01540 PRINT C$(3);CHR$(38);CHR$(34);"     +/-     New     ---- Player Holdings";
01550 PRINT " ----"
01560 PRINT C$(3);CHR$(39);CHR$(34);"Stk  Chng    Cost    .1..    .2..    .3..";
01570 PRINT "    .4.."
01575 PRINT C$(6)
01580 RETURN
01600 REM ======================================================================
01610 REM =                    SET UP SCREEN CONTROLS
01620 REM ======================================================================
01630 REM ====== CLEAR THE SCREEN
01640 C$(1)=CHR$(27)+CHR$(69)
01650 REM ====== FREEZE SCREEN (STOP AUTO LINE FEED FOR LINE 24)
01660 C$(2)=CHR$(27)+CHR$(121)+CHR$(56)
01662 REM ====== ADD DISCARD AT END OF LINE OPTION TO FREEZE SCREEN
01664 C$(2)=C$(2)+CHR$(27)+CHR$(119)
01670 REM ====== DIRECT CURSOR ADDRESS (DOES NOT INCLUDE X,Y OR CHAR PORTION)
01680 C$(3)=CHR$(27)+CHR$(89)
01690 REM ====== ENTER GRAPHICS MODE (CURSOR OFF)
01700 C$(4)=CHR$(27)+CHR$(70)+CHR$(27)+CHR$(120)+CHR$(53)
01710 REM ====== EXIT GRAPHICS MODE (CURSOR ON)
01720 C$(5)=CHR$(27)+CHR$(71)+CHR$(27)+CHR$(121)+CHR$(53)
01730 REM ====== PLAYER INPUT LINE ADDRESS
01740 C$(6)=CHR$(27)+CHR$(89)+CHR$(53)+CHR$(32)
01742 REM ====== ADD ERASE TO END OF LINE TO C$(6)
01744 C$(6)=C$(6)+CHR$(27)+CHR$(75)
01750 REM ====== PLAYER INPUT ERROR LINE ADDRESS
01760 C$(7)=CHR$(27)+CHR$(89)+CHR$(54)+CHR$(32)
01762 REM ====== ADD ERASE TO END OF LINE TO C$(7)
01764 C$(7)=C$(7)+CHR$(27)+CHR$(75)
01765 REM ====== YEAR DISPLAY LINE ADDRESS
01770 C$(8)=CHR$(27)+CHR$(89)+CHR$(37)+CHR$(35)
01775 REM ====== CASH DISPLAY LINE ADDRESS
01780 C$(9)=CHR$(27)+CHR$(89)+CHR$(51)+CHR$(38)
01785 REM ====== DIVIDENDS DISPLAY LINE ADDRESS
01790 C$(10)=CHR$(27)+CHR$(89)+CHR$(50)+CHR$(38)
01795 REM ====== ENTER REVERSE VIDEO
01800 C$(11)=CHR$(27)+CHR$(112)
01805 REM ====== EXIT REVERSE VIDEO
01810 C$(12)=CHR$(27)+CHR$(113)
01848 RETURN
01850 REM ===== ERASE OLD NEWS ======
01855 REM ** 25 SPACES IN LINE BELOW **
01860 R$="                         "
01870 FOR W1=40 TO 50:PRINT C$(3);CHR$(W1);CHR$(85);R$;NEXT W1
01880 RETURN
01900 REM ====== ERASE PREVIOUS GAMES STAT. & FINANCIAL DATA
01910 REM ====== NEXT LINE HAS 49 SPACES IN IT
01920 R$="                                                 "
01930 FOR X=40 TO 51:PRINT C$(3);CHR$(X);CHR$(34);R$:NEXT X:RETURN
01940 RETURN
10500 REM ======================================================================
10510 REM =              *-*-*  GAME DATA  *-*-*
10520 REM ======================================================================
10580 DATA 0,0,0,0,0,0,0,0,5
10590 DATA 0,0,0,0,0,0,-25,0,0
10600 DATA 0,0,0,0,0,0,0,15,0,0
10610 DATA 0,0,0,0,-5,0,0,0,0,0
10620 DATA 0,0,0,0,0,0,0,0,0,5
10630 DATA 0,0,0,0,0,0,5,0,0,0
10640 DATA 0,0,0,0,0,0,10,0,0,0
10650 DATA 0,10,0,0,0,0,0,0,0,0
10660 DATA 0,0,0,0,0,0,15,0,0,0
10670 DATA 0,-5,0,0,0,0,0,0,0,0
10680 DATA 8,5,5,0,0,0,0,7,0,0
10690 DATA 0,0,0,0,0,0,0,0,-25,0
10700 DATA 0,0,0,0,0,0,0,0,0,10,0
10710 DATA 0,-10,0,0,0,0,0,0,0,0
10720 DATA 0,5,0,0,0,0,0,0,0,0
10730 DATA 10,0,0,0,0,0,0,0,0,0
10740 DATA 0,0,0,0,0,17,0,0,0,0
10750 DATA 0,0,0,0,-15,0,0,0,0,0
10760 DATA 0,0,0,0,0,0,0,0,10,0
10770 DATA 0,0,0,0,0,0,0,-15,0,0
10780 DATA 0,0,0,0,0,0,0,10,0,0
10790 DATA 0,0,0,0,0,0,-15,0,0,0
10800 DATA 0,0,-8,0,8,0,0,5,0
10810 DATA -10,0,0,0,0,0,0,0,0,0
10820 DATA 8,0,0,0,0,0,0,0,0,0
10830 DATA 0,0,0,0,0,0,-5,0,0
10840 DATA 0,0,3,0,0,0,0,0,0,4
10850 DATA -8,0,0,0,0,0,0,0,0,0
10860 DATA 0,0,0,5,0,0,0,0,0
10870 DATA 0,0,0,0,-10,0,0,0,0
10880 DATA 0,0,0,0,0,0,0,10,0,0
10890 DATA -8,-5,0,0,0,0,0,-7,0,0
10900 DATA 10,0,0,0,0,0,0,0,0,0
10910 DATA 0,0,0,0,0,0,0,0,0,-14
10920 DATA -10,0,0,0,0,0,0,0,0,0
10930 DATA 0,0,0,0,0,-5,0,0,0
10940 DATA -2,-10,-7,-9,-2,-9,-7,-16,-4
10950 DATA 26,16,25,8,-14,21,14,-4,17
10960 DATA 18,23,11,12,46,18,-5,34,15
10970 DATA 23,28,-2,11,56,19,30,29,14
10980 DATA 20,15,15,7,-20,15,13,-10,12
10990 DATA 17,21,13,-2,37,23,23,19,14
11000 DATA 19,24,17,9,-5,26,13,-7,15
11010 DATA 11,18,14,11,67,15,22,18,13
11020 DATA 13,31,1,14,-11,18,18,-14,10
11030 DATA 14,-8,19,-1,-9,25,-10,13,19
11040 DATA 24,24,23,20,51,27,38,33,18
11050 DATA 12,14,13,10,10,20,21,25,8
11060 DATA 7,-6,10,-10,30,6,-19,22,-2
11070 DATA 9,10,7,-5,-20,12,21,18,7
11080 DATA 7,8,5,-6,-40,3,16,-14,4
11090 DATA 8,6,4,-4,40,8,4,-12,3
11100 DATA 6,4,3,3,-15,5,8,-8,5
11110 DATA 5,7,-1,-3,45,6,-10,10,4
11120 DATA -2,6,-3,-8,-20,7,10,14,6
11130 DATA 11,11,-5,-7,30,10,-11,-18,-4
11140 DATA -5,13,-8,6,25,4,18,-22,-4
11150 DATA -8,-10,-10,-15,-20,-20,-23,-25,-7
```


Circle 130 on Reader Service card.

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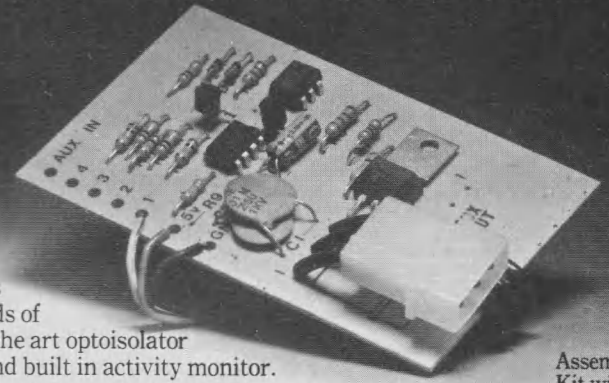

Our DCU is the original Drive Control Unit that turns floppy drives off during periods of inactivity by using a state of the art optoisolator with zero crossover control and built in activity monitor.

We've continued to improve the design (it's the size of a business card to fit within the drive), ease installation time (about 15 minutes) and models are now available for virtually all popular 8 inch drives (including a foreign version).

So for those of you, who are still grinding down your drives, wearing out media and exposing yourself to unnecessary noise...isn't it time to give them a break?

Assembled and tested $39.95
Kit with Documentation $29.95
Type of drive MUST be stated with order.
NY residents add local tax. Include $1.50 for postage and handling.

OPTRONICS TECHNOLOGY
P.O. Box 81, Pittsford, N.Y. 14534, (716) 377-0369

CALENDAR

Online 82

Eighty speakers will make presentations dealing with the impact of microcomputers on the on-line database industry at Online 82, scheduled for November 1–3 in Atlanta, GA.

During the conference, more than 75 exhibit booths will display and demonstrate databases, on-line systems, terminals, microcomputers and software.

For more information, contact Jean-Paul Emard, Online, Inc., 11 Tannery Lane, Weston, CT 06883, 203-227-8466.

Consumer Electronics Show

More than 20,000 buyers and tradespeople from 150 Far East electronics companies are expected to attend the fourth annual Hong Kong Consumer Electronics Show, scheduled for Nov. 2–4 at the Regent Hotel, New World Hotel and New World Center in Hong Kong.

Displays will feature audio and video equipment, calculators, computers, electronic toys, handheld games, watches and clocks.

For further information, contact A.D. Adams Advertising Co., 9 E. 38th St., New York, NY 10026. 212-685-9060.

AEDS Workshops

Three computer workshops are scheduled by the Association for Educational Data Systems for November and December.

The first, Computer Graphics/Microprocessor Personal Computer Systems, is slated for Nov. 4 and 5 in St. Louis, MO.

The second, Computer Literacy for Elementary School Educators, is planned for Nov. 12 and 13 in Atlanta, GA.

The final workshop, Instructional Uses of Computing, is scheduled for Dec. 2 and 3 in St. Louis.

For more information, call Shirley Easterwood at 202-822-7845 or write to AEDS, 1201 16th St., N.W., Washington, DC 20036.

NYSAEDS Computer Conference

"Moving Ahead With Instructional Computing" is the theme of the Seventeenth Annual Conference of the New York State Association of Educational Data Systems (NYSAEDS) on Nov. 7–9 at the Americana Hotel in Albany, NY.

The major topics to be covered are administrative uses of computers and curricular, hardware and programming issues.

For more information, contact Gary Bruce, 55 School St., Delevan, NY 14042.

CDLA Annual Meeting

The annual meeting of the Computer Dealers and Lessors Association is scheduled for Nov. 8–10 at the Greenbrier in White Sulphur Springs, WV. Programs will include "IBM Presents," "Leasing Strategies for the '80s" and "Computerizing Your Company."

For registration forms or information, write to CDLA Annual Meeting, 1212 Potomac St., N.W., Washington, DC 20007.

IIA Conference

A four-day exhibition sponsored by the Information Industry Association is planned for Nov. 8–11 at Walt Disney World Resort in Lake Buena Vista, FL. The show's theme is "The Information Business: Profits or Promises?"

The exhibition will feature the state of the art in information gathering, transfer and retrieval. For more details, call Karen MacArthur ar 202-544-1969.

Comdex/Europe '82 and Comdex/Fall '82

The Interface Group has announced the specifics of its Comdex/Europe '82 and Comdex/Fall '82 shows.

Comdex/Europe, the first European Conference and Exposition for Independent Sales Organizations, is planned for Nov. 8–11 at the RAI Exhibition Centre in Amsterdam, The Netherlands.

The show will feature hundreds of United States exhibitors and also will attract European and Japanese companies involved with small systems, software and supplies. The exhibit floor will include room for 1,500 booths.

Comdex/Fall, the fourth annual National Conference and Exposition for Independent Sales Organizations, is slated for Nov. 29–Dec. 2 at the Las Vegas (NV) Convention Center. The show is expected to open with more than 1000 exhibitors and 3200 booths.

For information on either show, contact The Interface Group, PO Box 927, 160 Spleen St., Framingham, MA 01701. 800-225-4620 or 617-879-4502 (in Massachusetts).

IEEE Software and Applications Conference

The Sixth International Computer Software and Applications Conference Technical Show, sponsored by the Institute of Electrical and Electronics Engineers, is planned for Nov. 8–12 at the Palmer House in Chicago, IL.

Displays will be set up on Nov. 9 and exhibit hours are scheduled for Nov. 10–12.

For more information on "The Technical Show for Software Professionals," contact the IEEE Computer Society, PO Box 639, Silver Spring, MD 20901. 301-589-3386.

Virginia Tech Workshops

Virginia Polytechnic Institute and State University in Blacksburg, VA, will sponsor two November workshops on microcomputer interfacing.

Personal Microcomputer Interfacing and Scientific Instrumentation Automation is scheduled for Nov. 8–12 and Microcomputer Interfacing, Design and Programming Using the Z80/8085/8080 is planned for Nov. 15–17.

Participants at both workshops will receive hands-on experience in designing and testing concepts.

For further information, contact Dr. Linda Leffel, C.E.C., Virginia Tech, Blacksburg, VA 24061. 703-961-4848.

Microcomputers in Education

The College of Education at the University of South Alabama, in cooperation with the School of Continuing Education, will sponsor a two-day workshop in Biloxi, MS, on Nov. 11 and 12. "Microcomputers in Education" will be the theme of the workshop.

For registration forms or information, contact Judy Campbell, University of South Alabama, Mobile, AL 36688. 205-690-6528.

Northeast Computer Show and Office Equipment Exposition

The largest public business equipment show in the United States is slated for Nov. 11–14 at Hynes Auditorium in Boston, MA.

The fourth annual Northeast Computer Show and Office Equipment Exposition will feature software and hardware for business, industry, government, education and home use. The show will include micro and mini computers, data and word processing equipment, peripherals, accessories, services and supplies.

To reserve display space at the exhibit or for more information, call the show office at 617-739-2000.

National Systems Executive Forum

"Managing Software Development" will be the theme of a conference sponsored by George Washington University's School of Government and Business Administration. The National Systems Executive Forum is scheduled for Nov. 15–17 in Washington, DC.

The forum will present reviews and briefings on methods for managing large and small software application development projects.

For further information, contact U.S. Professional Development Institute, 12611 Davan Drive, Silver Spring, MD 20904. 301-622-5696.

ISE-USA Executive Briefing

International Software Enterprises-USA, Inc. continues its "Executive Briefing" series that began in September. The final three dates are Nov. 16 in Milwaukee, WI, Nov. 17 in Minneapolis, MN, and Dec. 8 in Chicago, IL.

The four-hour seminars will focus on a variety of issues relating to the proliferation and use of microcomputers in business and industry, effective application development and database management in the micro environment.

For details, contact ISE-USA, 85 W. Algonquin Road, Arlington Heights, IL 60005. 312-577-6800.

Basic: A Computer Language for Managers

The American Management Associations, Inc. has scheduled a trio of hands-on training sessions involving programming. The sessions, planned for Nov. 16–18 in Boston, MA, Dec. 1–3 in New York and Dec. 13–15 in Chicago, IL, are titled, Basic: A Computer Language for Managers.

The course is designed for managers who are unfamiliar with computers and computer programming.

For details, contact the AMA, 135 W. 50th St., New York, NY 10020. 212-246-0800.

How To Swallow Your Computer

A/E Systems Report, a newsletter on automation, and Design Compudata, a directory on automation, will sponsor a two-day conference on problems faced by design firms when installing new computer systems.

The conference, "How To Swallow Your Computer," is planned for Nov. 18–19 at Peachtree Plaza in Atlanta, GA.

For further information, contact Susan Johnson, Design Compudata, 45 Van Brunt Ave., Dedham, MA 02026. 617-326-1319.

Applefest '82

San Francisco will be the site of the West Coast Applefest '82. The conference and exposition, scheduled for Nov. 18–21 in San Francisco's Moscone Hall, will feature Apple and Apple-compatible computers, software, peripherals, accessories and publications.

For details, contact Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167. 800-343-2222 or 617-739-2000 (in Massachusetts).

Applefest '82 was originally scheduled for Dec. 3–5.

Microcomputer Applications

Queue, Inc. has changed the date for the seminar Microcomputers in Mathematics, Science and Computer Education Curriculum to Nov. 20 from its original date of Nov. 12 and 13. The hands-on workshop will take place in Fairfield, CT.

For more details, contact Joy Segal, Queue, Inc., 5 Chapel Hill Drive, Fairfield, CT 06432. 203-335-0908.

Queue, Inc. also announced the cancellation of the symposium and exhibit, Microcomputers in the Language Arts Curriculum, originally slated for Nov. 5 and 6.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, *Microcomputing*, Peterborough, NH 03458.** Do not include any other material with your ad as it may be delayed.

Sinclair ZX 81/Timex 1000 user's group. Program exchange, quarterly newsletter, etc. For information: SASE to Diana Wright, 2170 Oakbrook Circle, Palatine, IL 60067 or call 312-934-9375.

Used Heath H-8 memory board, I/O card, terminal, software and complete H-8 system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Groton Fall, NY 10519

To any user of PolyMorphic Equipment: We need any information available concerning interfacing the PolyMorphic System with a Trendata 1000 Printer. Send informtion to Dr. James F. Calhoun, Department of Psychology, Psychology Clinic, University of Georgia, Athens, GA 30602.

Interfacing information particularly needed but any information on the Trendata printer would be most helpful.

8K Visible Memory, ASR33, TNW103 IEEE Modem, SYM with Basic, all $150 each. Send SASE for information. A. Singhania, 107 Fir, Lake Jackson, TX 77566. 713-297-3865.

ZX81/TS1000 Users: Free newsletter and software available from Z-WEST User's Group. No SASE, no money—just your name and address. Write us at PO Box 2411, Vista, CA 92083.

MICRO QUIZ

(from page 169)

Answer: 25

J = 1: L = 2 to 11.5 ⩾ 10 increments
J = 2: L = 4 to 11 ⩾ 8 increments
J = 3: L = 6 to 10.5 ⩾ 5 increments
J = 4: L = 8 to 10 ⩾ 3 increments
J = 5: L = 10 to 9.5 ⩾ 0 increments
J = 12: L = 24 to 6 ⩾ 0 increments
Thus, C is incremented 10 + 8 + 5 + 3 = 26 times, to give a final value of 25.

Package to Support Plotter

Ferox Microsystems Inc. has announced a version of the Graphpower business graphics package that supports the new low-cost Hewlett-Packard 7470A two-pen plotter.

The software allows IBM Personal Computer, Apple II and Apple III users to create multicolor overhead transparencies and paper output in minutes.

GraphPower creates line, pie, bar, stacked bar, side-by-side bar, text and financial report charts. Up to four charts per page can be drawn, with a wide variety of coding patterns, including three types of shading; 100 shading densities; and solid, dotted or dashed lines.

GraphPower is written in UCSD Pascal and requires a 64K Apple II, 128K Apple III or 128K IBM Personal Computer. It is priced at $295 and is available from Ferox Microsystems Inc., 1701 N. Ft. Meyer Drive, Suite 611, Arlington, VA 22209. Reader Service number 489.

Daisy-Aids

Daisy-Aids is a complete graphics software package for CP/M computers with daisy-wheel or thimble impact printers. Daisy-Aids consists of three programs including line/bar/scatter, pie charts and block charts.

The line/bar/scatter program starts by requesting titles and axis descriptions. Next, the axis types are selected and data values are entered. Six different lines can be plotted on the same graph.

The pie chart program generates single or comparison pie charts with diameters from two to six inches. Legends can be included inside or outside each slice. Two-color ribbons and different hashing schemes are possible.

Main menus for each program display a directory of graph files for that particular program. The main menu supports creating, editing, deleting and renaming graph files. All necessary file maintenance features are available from within the Daisy-Aids program. Escape Computer Software, Inc., PO Box 1771, Roswell, GA 30075. Reader Service number 492.

The Printographer

The Printographer is a graphics printer package that works on every combination of printer and interface with the Apple II/II Plus computers to print graphics in several formats. It has all the options found in other dump programs.

The program has the option to print pictures directly to disk, and then from disk without loading the file. This allows the printer to print your graphics out in single or multiple copies while you use the computer for other work. Using an ASCII Express, you can have your graphics printed out at a remote site via a modem.

The Printographer costs $49.95. Southwestern Data Systems 10761-E Woodside Avenue, Santee, CA 92071. Reader Service number 482.

The Personal Secretary

SOF/SYS has announced the release of The Personal Secretary for the Apple II computer. The package includes a lower-case adapter as well as the usual shift-key modifications.

The Personal Secretary features a built-in database and built-in mail-list merging. People buying the package can receive a $50 exchange credit toward purchase of the The Executive Speller (the company's top-of-the-line word processor) when they choose to upgrade. All files and functions of The Personal Secretary are compatible with The Executive Secretary.

The Personal Secretary sells for $99.95. SOF/SYS, Inc., 4306 Upton Ave. South, Minneapolis, MN 55410. Reader Service number 491.

The ZED-Full-Screen Editor

Zeducomp has announced the availability of ZED, a fast, full-screen text editor for Heath/Zenith personal computer users. When used with a suitable text-formatting package, ZED can be used for word processing applications.

ZED offers the following features: use of function keys for common editing operations; high-speed screen display; fast upward and downward scrolling; overlapped page scroll; forward and backward search/replace; ability to swap disks during edit; split and join lines; insert, indent and word-wrap modes; convenient block operations; blocks display in reverse video and 80-character maximum line length.

ZED runs on Heath/Zenith Z89, Z90 and H8/H17/Z19 personal computers with a minimum hardware configuration of 32K RAM and one 5¼-inch floppy disk drive.

ZED costs $35. Zeducomp, PO Box 68, Stirling, NJ 07980. Reader Service number 484.

Retirement Planning

This financial-planning program for the Atari 400/800 allows you to establish a retirement plan that takes into account your personal situation in relation to inflation, investment returns, retirement income, etc. The program performs the following functions:

- Calculates a rate of inflation that is unique to each user's budget.
- Calculates a retirement fund that enables the retiree to keep his income constant in real terms.
- Calculates the portion of the retirement fund that will be provided by current assets.
- Calculates the yearly savings needed in order to accumulate the necessary retirement fund.

The program is priced at $29.95, and requires 32K memory, disk drive and the Atari Basic cartridge. Advanced Financial Planning, 20922 Paseo Olma, El Toro, CA 92630. Reader Service number 481.

MICRO/SCAN

MICRO/SCAN is a database that stores information on 1400 publicly-held companies and 88 industries. The program is printed on two disks for the Apple II Plus and can screen, sort and rank companies in the database in seconds. The program can also print out investment and portfolio-analysis reports.

MICRO/SCAN operates without any timesharing or data-hookup charges, data processing turnaround delays, manual data entry or computer programming.

MICRO/SCAN costs $3600 per year. This price includes the MICRO/SCAN software program and complete updated database on the Ford 1400. You receive the database on two new disks each month for one year. A demo disk with complete user documentation is available for $25.

ISYS Corporation, 50 Church St., 4th Floor, Cambridge, MA 02138. Reader Service number 480.

PairStat

PairStat is a powerful collection of tools used to

evaluate and present paired data. The program includes data entry, computation and editing features; scatter or smooth line plotting; curve fitting; and calculations from the curves.

The program can use up to 1000 data pairs; plot up to 11 different data sets on one graph; and perform up to 20th order polynominal regressions.

The user can define functions to manipulate data. Curves can be integrated, differentiated and interpolated. Also, seven reports may be generated on the printer.

PairStat is designed for the IBM Personal Computer with one or two disk drives, 64K bytes of memory, 80-column display, IBM or Epson Printer.

PairStat sells for $150 from Davell Custom Software, PO Box 4162, Cleveland, TN 37311. Reader Service number 490.

Tax Package

Active Computer Enterprises has announced the availability of its federal tax preparation package. The program was designed and written using the expertise of both computer programmers and federally enrolled tax agents. The program has 14 schedules and 11 forms, and was field tested on over 3100 complete tax returns that were done by more than 40 tax counselors.

The program operates on any CP/M 2.2x operating system. Two eight-inch disk drives are required (5¼-inch formats will be available soon).

The tax program sells for $500; demo packages are available for $55. Active Computer Enterprises, 1953 E. Apache Blvd., Tempe, AZ 85281. Reader Service number 496.

POWER for CP/M systems

POWER gives you menu control for the CP/M operating system. With POWER you never have to type a file or program name in normal computer housekeeping chores. You transfer files without having to type file names. The computer feeds the names for you, and you select the files by number from a screen menu. With the numbered menu, you can erase files, type files to screen or printer and even run your programs. The purpose of the POWER menu function is to give you protection from your own typing mistakes.

POWER is a series of 50 user-friendly housekeeping CP/M programs in one 12K package. For the advanced programmer, the monitor commands read and write to any selected track or sector from any location in memory.

POWER's 50 commands are fully explained in the alphabetized 60-page manual. The package is hardware independent and will operate on any standard CP/M system.

It is available in all disk formats for $149.

COMPUTING!, 2519 Greenwich, San Francisco, CA 94123. Reader Service number 495.

PETSPEED

Small Systems Engineering has released the newest version of PETSPEED, the Optimizing Basic Compiler.

PETSPEED relies on optimization to reduce program running times, and eliminates unnecessary program complexities by analyzing source programs for the best ways to speed processing time. PETSPEED is available for any combination of 4000 and 8000 series Commodore computers using 8050 or 4040 disk formats.

PETSPEED automatically uses faster integer arithmetic whenever possible. Frequently occurring variables and arrays are handled automatically. It sells for $325. Small Systems Engineering Corporation, 222-B View Street, Mountain View, CA 94041. Reader Service number 485.

The Draftsman

The Draftsman is a general graphics program for the IBM Personal Computer that makes it fast and easy to produce quality charts and

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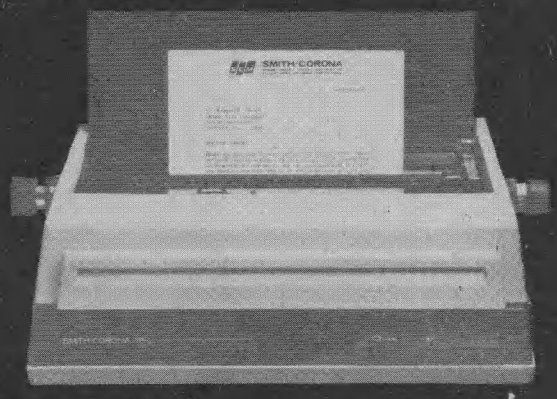

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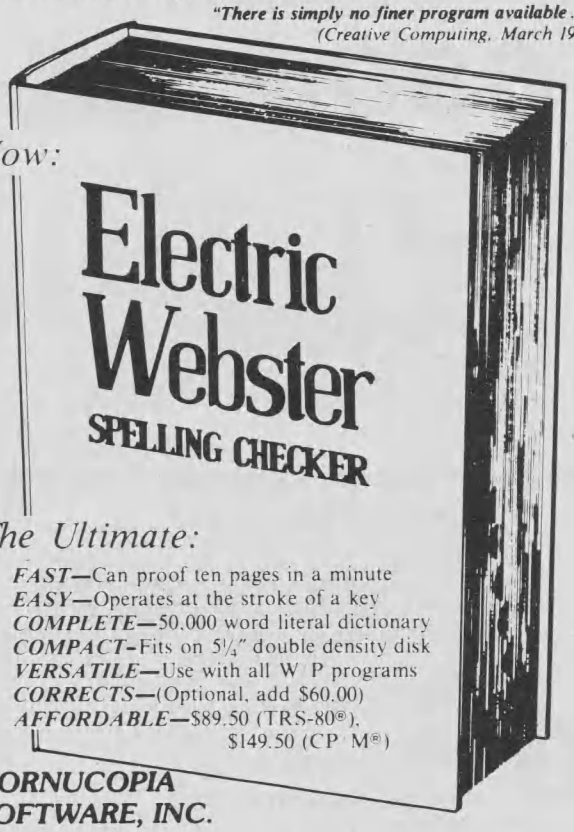
(Creative Computing, March 1982)



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FAST—Can proof ten pages in a minute
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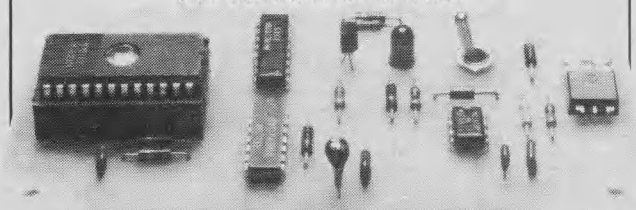
Contact your local dealer, or order direct — (415) 524-8098

EPROM PROGRAMMER

Shown assembled. EPROM not included.



For single supply 2516, 2716 & 2758 EPROMs. Connects through a user supplied interface to any computer system. Interfacing requires two 8-bit ports plus hand-shake lines. One of the ports must be software controllable for input or output. Timing is done via hardware, thus is independent of MPU clock rate. Verify erased. Program — entire or partial. Auto verify after programming. Transfer contents to RAM for modifying or duplicating.

Select Documentation for:	Interface to:
6502	6820 PIA or 6522 VIA
6800	6820 PIA
6809	6820 PIA
8080/8085/Z80	8255 PPI

Comprehensive documentation booklet contains schematic, instructions for construction, check-out and use, and a well commented assembly listing for the specified MPU.

Complete kit of parts (includes ZIF socket) ..... $ 45.00
Bare PC board and Documentation ..... $ 25.00
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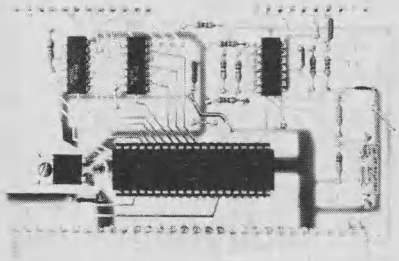
JPC PRODUCTS FOR 6800 COMPUTERS



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JPC PRODUCTS CO.
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12021 Paisano Ct.
Albuquerque, N.M. 87112

graphs.

The Draftsman can generate standard graphs with a minimum of input from the user. Screen images can be printed on the IBM or Epson MX-80 printer. Graph formats include all standard business graphs: pie charts, bar charts (including stacked and clustered bars), line graphs and scattergrams.

No special language or command syntax has to be learned to use The Draftsman. The entire user manual is stored on disk and can be viewed either sequentially or at random.

The Draftsman runs on the IBM Personal Computer with 64K bytes of memory; however, 128K is recommended. A color monitor and two disk drives are also required. The price is $200.

Starware, 1701 K Street N.W., Washington, DC 20006. Reader Service number 488.

Peachtree Graphics Language

Peachtree Graphics Language is a highly interactive graphics package that can be used with any CP/M-based computer. PGL is device-independent for both input and output, and includes two-dimensional and three-dimensional graphics transformation.

Pie and bar charts, multiple exploded pie segments, zooming, panning, strip chart scrolling, multiple independent graphs, rotation and graphic arts are among the included features.

PGL offers English commands that make it possible for inexperienced users to write interactive graphics programs for business, engineering and scientific applications.

Standard device drivers included with the system support the Hewlett-Packard HP-GL series of plotters, Epson printers, Digital Engineering Retrographics terminal, Summagraphics BitPad One digitizer and any Plot-10 compatible CRT.

Peachtree Software Incorporated, 3445 Peachtree Road, N.E., Atlanta, GA 30326. Reader Service number 479.

Secure

Secure is a program that is designed to stop unauthorized access to CP/M files. Secure uses two user-supplied keys to safeguard files on any Z-80 based microcomputer. Its file handling is limited only by available disk storage space.

Secure can be used to protect financial data, customer data, mailing lists, confidential correspondence, computer programs, or any data that will be transmitted to another location using a computer communications program.

The program is available on a variety of disk formats for any Z-80 based microcomputer using CP/M 2.0 or higher. Secure sells for $150. Century Systems, Inc., 12872 Valley View Ave. Suite 11B, Garden Grove, CA 92645. Reader Service number 487.

Landlord Version 2.0

The Landlord manages any kind of income property including: apartment, marinas, offices, retail space, shipping centers, single family homes, ministorage units, duplexes, aircraft hangars and trailer parks.

The Landlord keeps track of names, addresses, phone numbers, security deposits, rent charges and payments. The program can also print mailing labels. The Landlord can maintain information on 590 tenants.

The Landlord is flexible enough to be used by single property owners or by property management firms that manage multiple locations for different owners. The program will keep track of rental units up to 100 locations and for as many as 100 owners.

The Landlord sells for $795. The software requires an Apple II computer with 48K RAM, two disk drives and an 80-column printer. Min Microcomputer Software, Inc., 1501 Johnson Ferry Road, Suite 220, Marietta, GA

30062. Reader Service number 486.

The Big Math Attack

The Big Math Attack is an educational program designed to encourage learning in children from ages 6 to 12. The program combines the excitement and challenge of an arcade game with the basic math skills of addition, subtraction, multiplication and division.

An equation is launched from a spaceship. The child must enter the correct answer before the equation lands on the city. Feedback is given to the child after each answer. As his skill increases, the problems fall faster. The goal is to achieve the highest possible score before five problems land.

The Big Math Attack uses full color, high-resolution graphics, sound and easy-to-read numbers and letters. It is available on disk for the Apple II computer (48K, Applesoft). It is also available on cassette (16K) and disk (24K) for the Atari 400/800 computer.

The Big Math Attack sells for $25 on disk and $20 on cassette. T.H.E.S.I.S., PO Box 147, Garden City, MI 48135. Reader Service number 494.

Learning Games

Spinnaker Software has announced the release of three learning games for the Apple II, Atari 800(48K) or IBM PC(48K).

Snooper Troops is a series of interactive mysteries incorporating high resolution graphics and animation. The player is a private detective trying to determine which of eight suspects committed the crime. The game helps the player improve his analytical skills, and is aimed at the 10-to-adult age group.

Story Machine, for five- to nine-year-olds is a software toy that teaches the young computer user how to communicate with the computer while developing his ability to write sentences and paragraphs. The child writes any sentence desired using nouns, verbs, prepositions, etc., which are provided for the child. Several sentences can be sequenced to form a paragraph. The computer animates the sentence or paragraph using full-color graphics and sound. For example, if a child writes "The boy jumps over the house," a boy and a house will appear on the screen, and the boy will jump over the house.

Face Maker, for the five-to-eight age group, presents a blank face outline which the child can complete by selecting from menus of eyes, ears, hair, etc. The child can write very simple programs which will animate the completed face through a series of expressions (smile, wink, frown, wiggle ears, stick-out tongue). There is a memory-development game in which the computer performs a sequence of expressions with the face; the child then tries to exactly repeat the sequence.

Snooper Troops I and II cost $44.95 each. Story Machine and Face Maker are each $34.95. Spinnaker Software, 26 Brighton St., Belmont, MA 02178. Reader Service number 483.

Millionaire

Millionaire is a computer game that brings you into the world of Wall Street. Players can manipulate as many as 15 different stocks and can perform an array of transactions including buying and selling stocks, put options, call options, buying on margin, borrowing against your net worth and others.

You can summon each of the 15 stocks' corporate histories as well as week-by-week industry trends and graphs. Millionaire is available for the Apple II Plus, Apple III ($79.95); IBM Personal Computer, Osborne and other CP/M systems ($99.95). The game is available on 5¼-inch and eight-inch disks.

Blue Chip Software, 18656 Ventura Blvd., Suite 215, Tarzana, CA 91356. Reader Service number 493.

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MW-100 is the first American printer for the TS 1000 personal computer.

MW-100

The MW-100 is the first American printer for the Timex-Sinclair TS 1000 personal computer (formerly the ZX81). The MW-100 is a dot matrix printer that uses standard 1¾-inch adding machine paper tape and ribbon cartridges.

The printer generates a 16-character line, half of the TS 1000's 32-character screen. It can be operated in any of three modes. For displays that are already 16 characters or less, the printer will reproduce the contents of the screen line for line. For wider displays, the MW-100 can either print consecutive half-lines, or else output both sides of the screen separately.

You can use the TS 1000 to keep hard copy records of programs, print out lists of data, run mailing lists and generate complicated spreadsheets and reports. MW 100 is priced at $119.95 and is manufactured by Mindware, Inc., 70 Boston Post Road, Wayland, MA 01778. Reader Service number 474.

Cameo Electronics' Winchester hard disk subsystem.

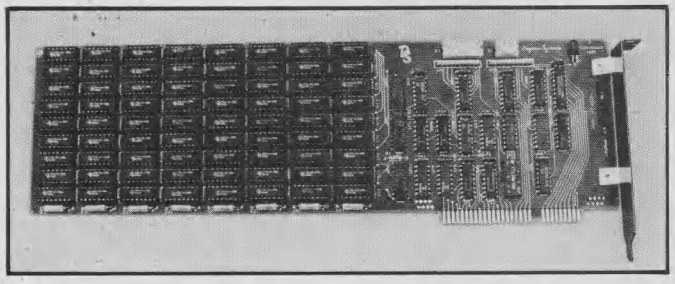
The Series 2000

Cameo Electronics, Inc. has announced a line of 5¼-inch Winchester subsystems. The Series 2005 (5 megabyte) and the Series 2010 (10 megabyte) allow up to 20 megabytes of on-line data per system.

Apple DOS, CP/M and Pascal can be used together on the same drive by segmenting the disk into volumes (19 volumes per disk) and specifying the operating system for each volume. The drive is menu driven, and the most commonly-used commands are simplified into single-key commands.

The Series 2005 and Series 2010 are available for the Apple II using Apple DOS, CP/M and Pascal operating systems. Interfaces for IBM PC, Commodore PET, TRS-80 Models I, II and III and other computers are to be released in the near future.

The Series 2005 costs $2295. The Series 2010 is priced at $2995. Cameo Electronics, Inc., 1626 Clementine, Anaheim, CA 92802. Reader Service number 477.



The UltraRAM memory board for the IBM Personal Computer.

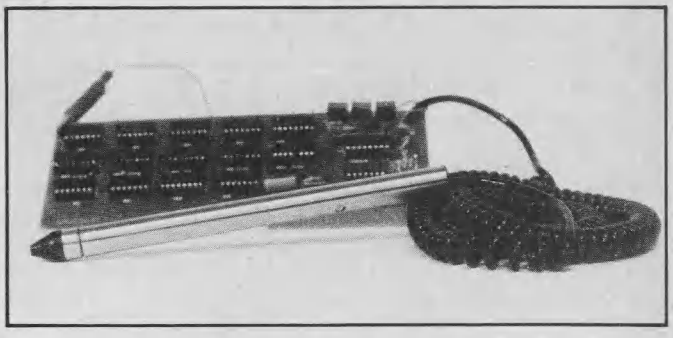
UltraRAM

Daystar Systems has introduced UltraRAM for the IBM Personal Computer. The add-on memory boards range in single slot size from 128K bytes to 512K bytes on a single board. Standard features include programmable start address, programmable block enable, parity-detection circuitry and fully expandable socketed memory array.

UltraRAM is plug compatible with IBM RAM expansion cards, and runs all IBM-supported software. The price ranges from $795 (128K) to $1595 (512K). Daystar Systems, 10511 Church Road, Suite A, Dallas, TX 75238. Reader Service number 472.

A Slimline Light Pen for Apple

Symtec has introduced a Slimline light pen for the



Symtec's Slimline light pen for Apple.

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- ★ OS-9 LEVEL TWO Multi-User Operating System
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- ★ 1 MB 5¼" Floppy Disk Drive
- ★ DMA Double Density Floppy Disk Controller

SOFTWARE FEATURES:

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- ★ OS-9 Text Editor
- ★ OS-9 Debugger
- ★ OS-9 Assembler

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Winchester packages are available for upgrading current **GIMIX** 6809 systems equipped with DMA controllers, at least one floppy disk drive, and running FLEX, OS-9 LEVEL ONE or OS-9 LEVEL TWO. The packages include one or two 19MB (unformatted) Winchester drives, DMA Hard Disk Interface, and the appropriate software drivers. The Interface can handle two 5¼" Winchester Drives, providing Automatic Data Error Detection and Correction: up to 22 bit burst error detection and 11 bit burst error correction.

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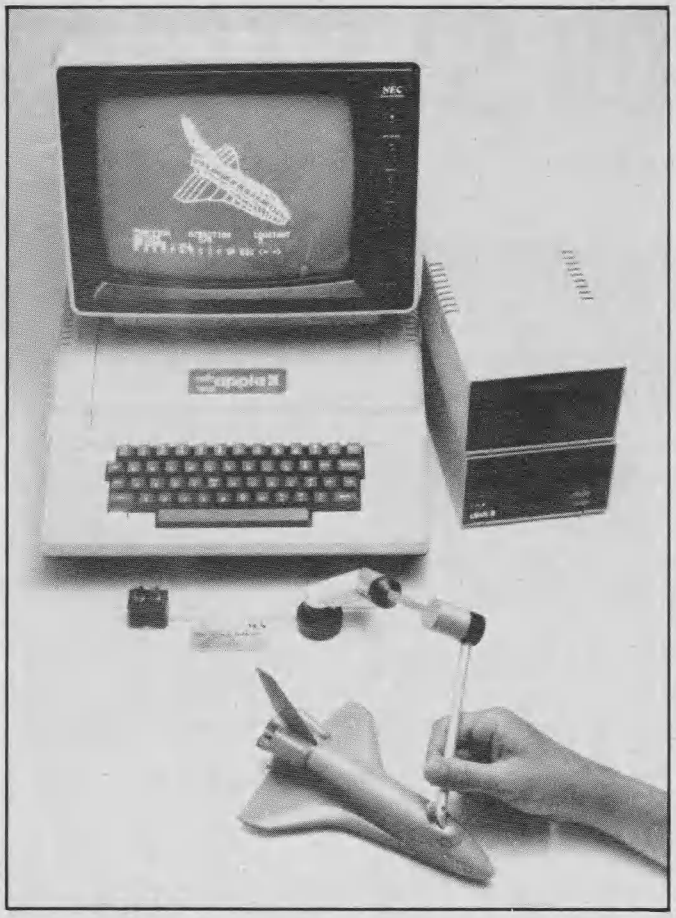


The Space Tablet, the first three-dimensional spatial digitizer compatible with Apple II and IBM Personal Computers.

Apple computer. The pen provides high resolution in excess of 55,000 screen locations.

The pen comes with a complete interface for the Apple computer, and is supplied with full documentation and software on disk. Some possible uses are interactive video applications, point-to-operate control of any computer feature for shows and exhibits, and screen digitization. The light pen also lets you draw on the CRT as if you were using pencil and paper.

The pen costs $250 from Symtec, 15933 West 8 Mile, Detroit MI 48235. Reader Service number 470.

A Space Digitizer

IBM Personal Computer and Apple II owners can record the x, y and z coordinates of any three-dimensional object with the Space Tablet, a space digitizer.

The Space Tablet comes complete with Space Graphics of Penguin Software's Complete Graphics System II. With a single motion of the tablet arm pointer, a user can literally pull points and lines to new locations in three-dimensional space.

Applications include art, architecture, mechanical engineering, chemistry, education and medical research. The Space Tablet costs $600 and is available from Micro Control Systems, Inc., 143 Tunnel Road, Vernon, CT 06066. Reader Service number 473.

E-1 System

The E-1, from Euclid Computer, Inc., is a single- or multi-user microcomputer based on the 8086-1 microprocessor, and is designed to operate at 10 megahertz with no wait states.

The MP/M-86-based 16-bit microcomputer is capable of operating up to ten remote workstations. The multi-user system can be upgraded to one megabyte.

The system's minimum configuration includes 512K Dynamic RAM with National Semiconductor's 8409-2 chip and two eight-inch, single-sided, double-density floppy disk drives with a total formatted capacity of over one megabyte of disk storage. The E-1 costs $5995.

Euclid Computer, 3699 West 240th St., Torrance, CA 90505. Reader Service number 475.

New Corvus network and Winchester disk systems allow up to seven Osborne 1 computers to share up to 80 megabytes of on-line mass storage.

Corvus Disk System For the Osborne

Corvus 6-, 11- and 20-megabyte Winchester disk mass storage systems are now available for the Osborne 1 personal computer. The Corvus disk system offers speed, reliability and greater storage capacity.

Installing the Corvus disk system is a quick and easy process. The cable from the Corvus interface card plugs directly into the IEEE-488 port on the front of the Osborne, so it can be connected or disconnected in just a few seconds.

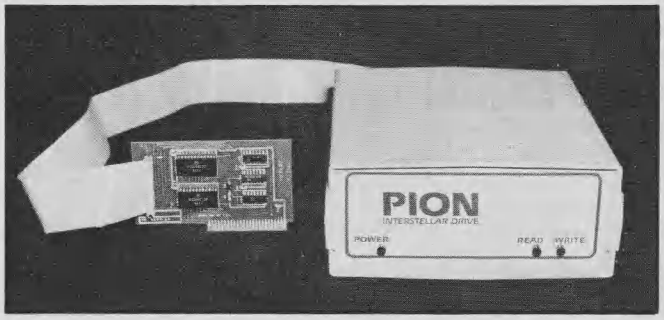
The disk system is priced at $3195 complete with interface card and all required software. Corvus Systems, Inc., 2029 O'Toole Ave., San Jose, CA 95131. Reader Service number 469.

Interstellar Drive

The Interstellar Drive, a solid state disk drive emulator, has been introduced by Pion, Inc. Taking advantage of the latest second generation high density 64K DRAM technology, the product provides a fast mass storage device which speeds up any scientific, educational or business program requiring disk access.

The basic unit consists of 256K bytes of storage, user-expandable to 1 megabyte, and an appropriate interface card and all necessary cabling.

Interstellar Drive comes with its own independently regulated power supply to prevent power drain to the host microcomputer. Hardware error detection assures valid data. Hardware write protect prevents inadvertent data loss.



The Interstellar Drive is a solid state drive emulator from Pion, Inc.

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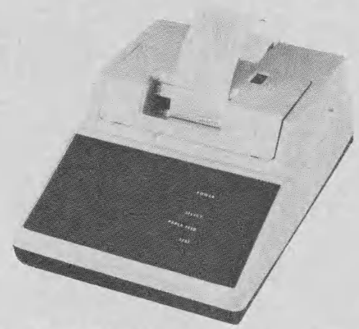

Dot Matrix Printer Interfaces with Apple II
Featuring an Apple II®-compatible parallel interface, Addmaster Corporation has produced a new dot matrix printer, Model 170. The interface includes a Centronics-type handshake and DB-25 interface connector, Baudot, and day — and time clock. The Model 170 provides 18 or 21 characters per line, 6 lines per inch print density, on standard 2½" adding machine tape. Designed to use with personal computers, Model 170 will produce hard and carbonless copies of programs, data or results. **Write Addmaster Corporation, 416 Junipero Serra Dr., San Gabriel, CA 91776 or call 213/285-1121.**

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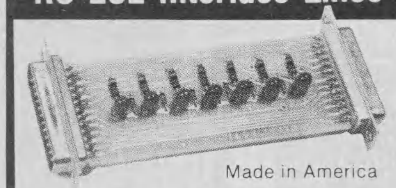

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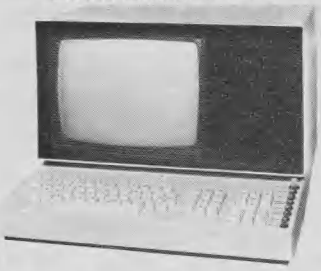

12" Green Ball Brothers monitor with enclosure measuring 19" × 16.5" × 14". Room inside to mount a Ferguson single board computer or small SS-50,S-100 system. (Power supply available, see below.) Requires +15 volts DC @ 1.5 amps, noncomposite (separate sync) input. A sync separator schematic is available. It is also possible to mount a single 8" disk drive or two of the new slim line 8" disk drives in this enclosure. All units are used, and have been 100% tested.

Shipping weight 35# $65.00

ASCII Keyboard (used) with enclosure to match above monitor. 77 keys, 7 lighted pushbuttons, on/off sw. Requires 5 volts DC. Schematic included. Includes shift, tab, control and cursor control keys. Size: 19 × 4 × 5½.

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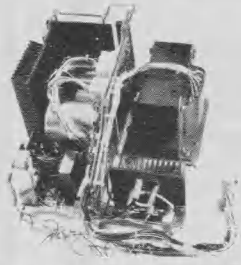
Modular power supply (missing regulator card) fits inside above monitor enclosure. Includes large transformer that outputs +8.5 volts @ 17 amps, +/−18 volts @ 1.5 amps each, +15 volts @ 1.5 amps (for monitor), three large capacitors (1-18kuf, 2-8kuf), 1–30 amp, 2–3 amp bridge rectifiers. The transformer and rectifiers/capacitors make a perfect unregulated SS-50/S-100 power supply. The schematic for the regulator card is available.



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These first graders talk to their computer using the VBLS voice-based learning system with voice input.

Drivers, diagnostics and utilities software are all provided as part of the basic package.

The Interstellar Drive interfaces with most popular microcomputers, including the Apple II and TRS-80 Model III, and with SS-50 and S-100 compatible machines.

The product costs $1095 and is available from Pion, Inc., 74 Appleton St., Arlington, MA 02174. Reader Service number 460.

VBLS A Voice-Based Learning System

VBLS is a voice-based learning system that operates with the Apple II microcomputer. The system enables the user to communicate with a computer simply by talking to it in any language.

The system uses the computer, a microphone, a Scott Instruments' VET (voice entry terminal) and VBLS software. These components form an instructional tool for voice-based tutoring, drill and practice, review and testing.

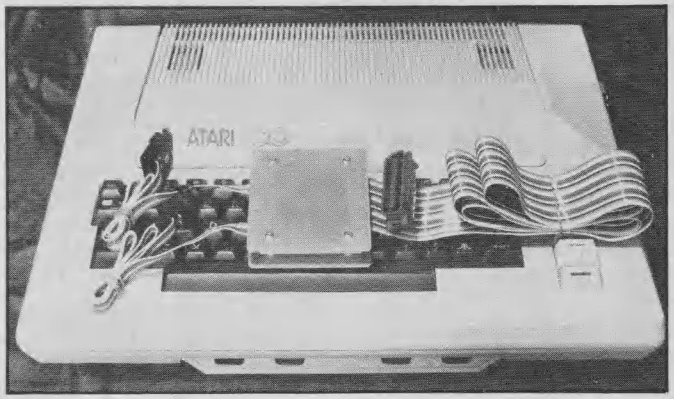
To author a VBLS lesson, you type each question and answer into the computer. You then give the answer verbally into the microphone. As the spoken answer is entered, the computer is "learning" the author's voice pattern.

Some possible applications of VBLS are bilingual and foreign language study, technical and management training, pre-college basics, on-the-job skills training, remedial studies and special educational programs for the handicapped.

Price for a complete unit is $894.95, and it is available from Scott Instruments Corporation, 1111 Willow Springs Drive, Denton, TX 76201. Reader Service number 468.

Atari Interface No. 1

Interface No. 1, by Looking Glass Microproducts, lets you connect any printer with a Centronics-compatible parallel interface to your Atari 400/800. The interface connects using controller jacks



Interface No. 1 for the Atari 400/800 by Looking Glass Microproducts.

The RX-10 provides automated control of all lights and appliances.

J3 and J4.

A printer handler is provided on either cassette or disk. This handler replaces the resident one, and occupies less than 128 bytes of the program area. The printer handler is compatible with all Atari cartridges and programs.

The Interface No. 1 sells for $85. Looking Glass Microproducts, PO Box 5084, Loveland, CO 80537. Reader Service number 476.

RX-10

The RX-10, developed by Environmental Control Systems, provides automated control of all lights, appliances, etc., using the intelligence of a personal computer. The RX-10 is a direct line interface: there is no unreliable ultrasonic link. A command console is not required for operation; however, it might be desirable for additional points of control.

Control of any electrical device connected to a remote switch is accomplished by a computer program which simply outputs values to the port to which the RX-10 is connected.

Home control, energy management and security are examples of applications for personal computers. The RX-10 connects to any computer via a parallel port. If your computer does not have a spare parallel port, an interface card will be necessary.

The RX-10 is priced at $149.95, plus $5 shipping and handling. Environmental Control Systems, 9319 Willowview Lane, Houston, TX 77080. Reader Service number 461.

Pagemate

Pagemate is designed to hold any size book or magazine in place while you perform word processing or any task that requires you to refer to a source. The product allows you to save a great deal of time and aggravation.

Pagemate comes with extenders that make it easier to hold thick or heavy books. With the extenders the product costs $15.95, and can be obtained from Pagemate, Inc., PO Box 199, Tulsa, OK 74101. Reader Service number 467.

The Pagemate holds books or magazines in place while you work on your computer. It's ideal for word processing.

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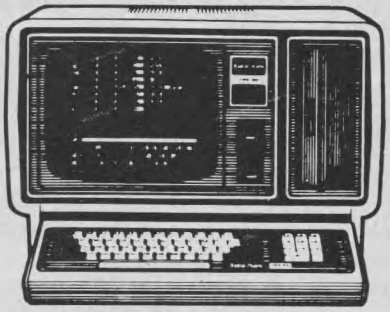

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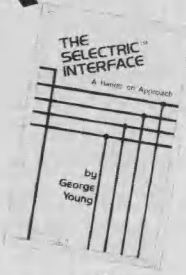

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The Add-A-Switch provides a power on/off switch omitted in the original design of the ZX-81.

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The switch is a 1½ × 1½ × one-inch unit that installs with no computer modifications. Add-A-Switch costs $14.95 and is available from Lyon Ware, 1520 S. Lyon, Santa Ana, CA 92705. Reader Service number 465.

Elite Controller Card

The Elite Controller Card offers an economical and sophisticated alternative to the standard controller card. The product has four-drive capability and is designed for any combination of Rana Systems Elite Minifloppy Disk Drives or Apple II Disk Drives.

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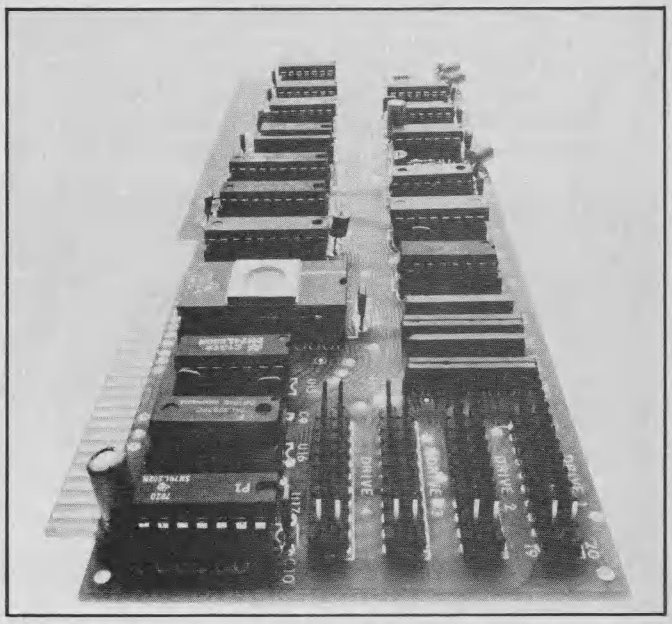
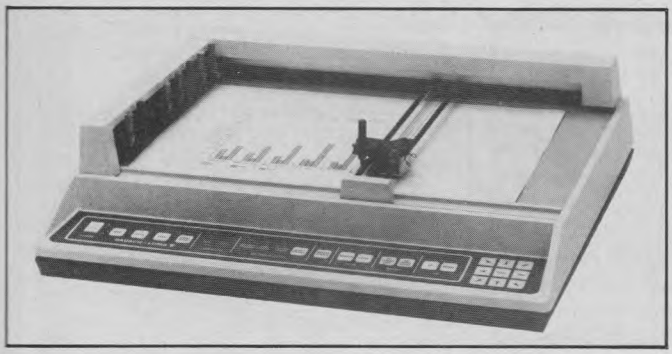


The Elite Controller Card, from Rana Systems.



The DMP-29, an eight-pen plotter from Bausch & Lomb.

The Elite Controller Card costs $135, and is available from Rana Systems, 20620 South Leapwood Ave., Carson, CA 90746. Reader Service number 466.

DMP-29

Houston Instruments Division of Bausch & Lomb has introduced DMP-29, an 11 × 17-inch eight-pen plotter that features heightened performance and firmware attributes. The plotter attains a maximum pen speed of 22 ips. Higher plotter speed combined with an addressable resolution of 0.001 inch assures fast, quiet, accurate and stepless traces. Two Z-80 microprocessors supervise internal operation of the DMP-29 flat-bed plotter.

Inherent capabilities of the DMP-29 enable the plotter to define window limits, scale plots up or down as required, vary line intensity and invoke European character sets. It also automatically describes circles, ellipses and general curves. Internal diagnostics ease setup and maintenance, while self-protect features guard against operator error.

DMP-29 costs $1995, and is available from Houston Instrument Division of Bausch & Lomb, PO Box 15720, Austin, TX 78761. Reader Service number 464.

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Mac Inker is available with multicolored inks and with cartridge loading stations for any current printer. The product costs $54.95, and can be obtained from Computer Friends, 100 NW 86th Ave., Portland, OR 97229. Reader Service number 462.

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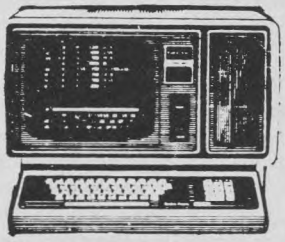

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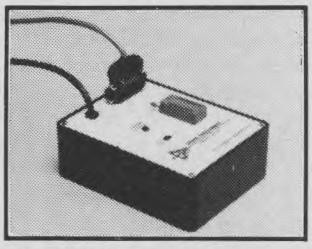

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(from page 194)

protection via a ROM chip, and I don't like it at all. In this case, at least, it removes a great deal of the Apple's versatility.

For example, I use two word processors on my Apple, both of which require a hard-wire modification for caps and lowercase. This modification connects to the game I/O socket, and until now did not affect other software.

But the Basic' ROM chip also plugs into this socket, and with the word processing modification does nasty things to the keyboard output. For instance, I get @ for a P. With the Basic' ROM and word processing modification both in place, I can't even do a PR#6. Of course, I can rip out the word processing modification every time I want to run Basic' and remove the ROM every time I want to use the word processor, but this can be a pain in the backside.

I think the manufacturer will get a lot of complaints over this particular kind of copy protection. (Delta tells me that they have replaced this ROM with another, solving the problem. I would verify that before purchasing off the shelf.)

Incidentally, the manual says to install the chip so that the mark faces the front of the computer. No mark was visible on the chip I got with the program. Obeying Murphy's Law, I installed it backwards the first time, and nothing worked. Luckily, it's a passive device and no harm was done. When I turned it around it worked like a charm—except for being incompatible with my word processor.

According to the manual, if the security chip dies after the 90-day warranty, I must pay $25 for a new one. I hate the thought of having to pay for an item that protects the manufacturer and does nothing for me.

I have a Videx Videoterm 80-column board with software switching. Something in the Basic' initialization activates the board, but Basic' does not support it. This took some figuring out, for the screen went blank and the program appeared to hang. When I finally plugged the monitor directly into the Apple's 40-column output, all was well again.

These two problems require me to spend several minutes converting my Apple for use with Basic', and several more converting it back to word processing. My poor brain being what it is, I usually have a false start before remembering to make the conversion.

Operational Difficulties

The documentation recognizes that some Apples have more than one disk drive, but the program supports only one—except in the catalog function. This means that if you're saving your program under development to a data disk, you must swap disks every time you want to switch modules in Basic'.

The copyright notice comes up whenever you enter Edit mode, and this is evidently on a separate little program, for you must wait for it to time out before the disk starts to load the Edit module. When you want to switch in and out of Edit often, this is frustrating.

The printer toggle is on the master menu, with no way to turn the printer on or off from within a module. This means that if you have the printer on when you select Edit, and accidentally press "P" without being in Add mode, you'll have a long wait while the system prints out a listing that you didn't want.

Occasionally the program crashes with the message, "SYSTEM ERROR #"(n). This is neither a frequent nor a serious problem. It's not serious because no data is lost, and a second attempt has always succeeded for me.

The manual asks that the user write Delta when system errors occur, identifying the error number and describing the circumstances—hopefully, so they can strengthen the program.

Conclusion

In spite of these problems, Basic' is a joy to use. It forces us into structured programming, and results in a program that's easier to plan, code and debug. It includes a number of commands not normally available in Applesoft, and yet produces a program that runs in Applesoft. I will probably use it in spite of its faults, and hope that a later version will clear those up.

(Delta Micro Systems, PO Box 15952, New Orleans, LA 70175. $129.)

David Goodfellow
Seattle, WA

Word Juggler

A word processor
For the Apple III that
Performs like the giants

Word processing—no modern office should be without it! Unfortunately, many corporations consider only the offerings of giants like Xerox, Wang and DEC.

Having long desired a word processor, we found that a microcomputer with a letter quality printer appeared to be capable of fulfilling our word processing needs for little more than $6000. What was discouraging was the apparent unavailability of word processing software that was both powerful and easy to use. True, there were many offerings, but most paled in comparison to a machine dedicated solely to word processing.

I was fortunate enough to encounter Word Juggler, a word processing program designed for the Apple III.

Word Juggler is a well-designed program that utilizes the number keys on both the typewriter board and the keypad to effect word processing operations. A plastic template, imprinted with the special functions of the keys, is provided.

For each special-purpose key there are two options shown, one above the other. The upper one is invoked by using the shift key. So that the standard QWERTY numbers and symbols are not disabled, the word processing functions at the top of the keyboard are accessed by first hitting the escape key (renamed Command by Word Juggler).

Examples of the Word Juggler key sequences required to perform typical operations are:

Start a new page: hit command, then new page

Center a phrase: hit command, then center

So far this looks pretty easy, but how about the more complex things like block moves and block copies? Both are easy! Hit the "5" key on the numeric pad and the message "POSITION CURSOR TO START OF BLOCK TO COPY AND PRESS SPACE" appears at the bottom of the screen. Compliance with that request yields another message: "POSITION CURSOR TO END OF BLOCK TO COPY AND PRESS SPACE." Following a response, the final message appears: "POSITION CURSOR TO LOCATION TO INSERT BLOCK AND PRESS SPACE."

The copying is very quick, taking less than two seconds to copy the above and does not involve the disk thrashing common to many other word processing programs for micros. A block move proceeds in a similar manner.

Other features included are block load and store, search and change commands. The change command can be either automatic, changing every occurrence of the search string, or manual, where the user is shown each occurrence in context and is asked whether or not the change should be made.

Both the search and the change commands can be invoked from either the current cursor location or from the start of the document. Text can be justified on both margins, centered, or left justified only. Automatic page numbering and the automatic repeating of labels on each page are provided.

As a bonus, Visicalc III print files can be edited as can Business Basic program files. The latter is important to me since I feel the editor provided with Business Basic is awkward.

Print enhancements such as underlining, bold printing, and superscripting and subscripting are made possible with

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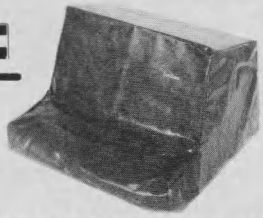

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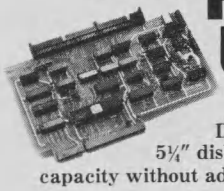

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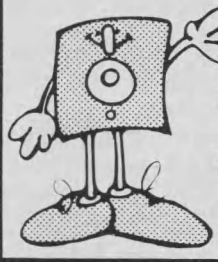

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the use of a key peculiar to the Apple—the "open apple" key (it has an imprint showing the outline of the now familiar partially-eaten apple). Underlining is initiated by simultaneously pressing the "open apple" and the "u," and is terminated by "open apple" with "U." Subscripting is started by "open apple" and the down-arrow key and is stopped by "open apple" and up arrow. All print enhancement symbols appear in inverse video within the text.

Movement of the blinking cursor is controlled by the four arrow keys provided by Apple. By using the shift key with the left or right arrows, the cursor moves in increments of words rather than characters. The shift key and up or down arrow keys move the cursor to the start of the next video page. Striking the control, shift and the up arrow key moves the cursor to the start of text.

Keys are provided to delete the character preceding the cursor, the character at the cursor's position, the current word, and also to the end of the paragraph. The insert or replace mode is chosen by the "7" key on the numeric pad (the blinking cursor contains a "+" sign when in the insert mode).

In an inverse video display at the bottom of the screen, Word Juggler displays the name of the document, the current position of the cursor and the number of free blocks remaining in memory. Commands such as new page are embedded in the text as are end-of-paragraph symbols (a right arrow.) Formatting commands can be either included within the text or set up as defaults.

There is a "display document" key that permits the document to be previewed in the form it will assume on paper. While displaying the document in final form, Word Juggler marks where a page break will occur with a horizontal bright line.

This is a great aid and helps the user know where to insert pause and new page commands. In the display mode, text in excess of the screen width or length is viewed through a smoothly scrolling window controlled with the direction keys.

At any point during processing, the user can call up the main menu to either store the current document, load a new document, begin a new document, catalog the disk, or purge files from the disk. Word Juggler contains safety prompts to make sure the user doesn't inadvertently overwrite a needed document already on disk or accidentally clear the current document from the workspace without first saving it.

The main menu thoughtfully permits the user to format a new disk without exiting the program. A help key instantly displays the edit key sequences at the top of the screen. All of the bouncing back and forth to the menu or to the help screen is accomplished without having to access the Word Juggler disk, and without losing any of the document.

A nice feature of Word Juggler is its ability to change printer configurations without going through a utilities disk. The printer driver contains options for most correspondence quality printers. The appropriate options are readily chosen without needing to know what each byte of the driver's configuration should contain.

Quark Engineering also offers a spelling checker, Lexicheck, for $195, that checks the document against its 30,000-plus-word dictionary at a rate over 8000 words per minute using floppies. (It took less than 30 seconds to check this document.) A hard disk permits a higher rate. Lexicheck displays the number of words in a document, the number of unique words, and the number of words not in its dictionary.

Unrecognized words are shown in context and may be replaced before proceeding to the next unrecognized word. You can add words to an auxiliary dictionary if desired. Like all spelling checkers, this one will not catch mistakes like "go reed a book."

Word Juggler is so easy to use that our secretary was creating and printing documents without reading the manual!

There are a few things that I wish Word Juggler would do. Sometimes I get carried away and delete too many words and would like to retrieve them from never-never land. I would also like to be able to bounce through text by sentence or by paragraph. Soft hyphenation would also be nice. However, I am not complaining.

Quark has come up with a product that is so easy to use that our secretary was creating and printing documents without reading the manual! This is not a procedure I recommend since the loose-leaf documentation starts with an excellent tutorial.

A benefit is that, for the price of a big Xerox 860, we now have two Apple III's—one for excellent word processing and another to perform our financial analyses, plus we have $3000 in change.

(Quark Engineering, 1433 Williams, Suite 1102, Denver, CO 80218. $295.)

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VersaForm

If you can afford
Only one program for
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A lot of the programs you've read about sound pretty good, but it's hard to picture them paying for themselves. Right?

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Instead, VersaForm will let you design just about any sort of filing and analysis system you want; for the small businessman or homeowner who perhaps can afford to buy just a single program . . . this is the one.

VersaForm is billed as a "business forms processor," and the manual starts out by asking, "Can you fill in a business form? Then you can use a computer!" With VersaForm, it's true.

The thing that separates VersaForm from other, standard-type programs is that VersaForm handles documents, rather than just raw data. You first structure the business form you want. When the information on the form (customer's name, address, phone, etc.) is filled in, VersaForm files it away as a complete document, much as you'd file a piece of paper or ledger card containing the same information.

When you retrieve the information, it's displayed or printed just as if you'd pulled that item from a file cabinet.

But, since the data is on disks, VersaForm can do all sorts of analysis on the information for you, all to your own specifications.

So, while you may not be able to justify the cost of a pure inventory system for your business, VersaForm can handle the inventory for you. While you may not want to buy a program that can do mailing lists, VersaForm can do that, too. Also, it can take care of your personal records, sales analysis, budgeting information, invoicing . . . and just about any sort of file-type system you can imagine.

On top of this, when you buy an inventory program, for instance, you're limited by the choices in the program itself. For example, you'd probably have an out-of-stock summary report in about any inventory program you'd buy, but if you used VersaForm to handle your inventory, you can custom design any type of report you want.

The point is that once VersaForm has the information, you can extract it in about any combination you desire.

To do all this, you need an Apple II+, with two disk drives and an extra 16K bytes of memory. You can get that with the extra language card or a memory board (about $150). VersaForm is written in Pascal, which your Apple will understand. The only real differences are that

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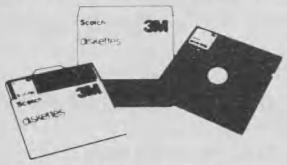

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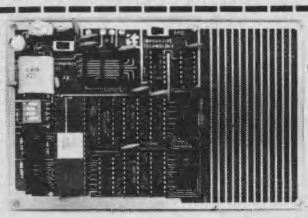

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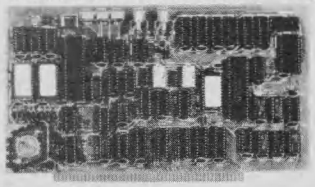

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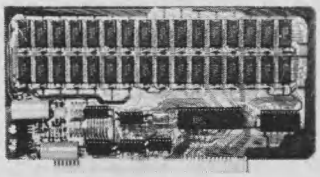

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your disks for your files must be "named" (the system does that for you quickly and easily) and that your first disk drive is #4, and your second is #5 (they're #1 and #2 with Apple DOS). Sticking a little number on the disk drives will help you remember.

VersaForm can support and work with an 80 column board, if you have one, and also with a fixed disk.

The program comes with six disks, a thick instruction manual, a quick reference card and a little booklet for a hands-on experience using the system. One of the disks is a tutorial disk, designed to be used with the booklet; it gives you a chance to play with VersaForm, and design forms, print reports and change data without taking the chance of ruining something. Good idea.

The one thing you need to keep in mind when you're using VersaForm is that you have to spend some time thinking about the information you want on your form before you actually start to design it. As you're designing the form on your video screen, you can change it, of course, as much as you like. But once you've started to save data using this form, you're not allowed to change the form itself. So the lesson is to think ahead a little bit and make sure all the information you might need is included in the form before you start. It's not a bad idea to include a couple of extra miscellaneous lines for data in case you forget something.

As you design the form, VersaForm has two options you can use: automatic checking and automatic filling.

Automatic checking will check the items entered against specific conditions that you set up when you design the form. For example, if your inventory numbers have three letters, a dash, two numbers, another dash, a letter, a dash and then two numbers (like JBL-44-A-37), you can instruct VersaForm to accept inventory item numbers that exactly match that format, and to beep and not accept any other format.

Automatic filling lets you use VersaForm's unique capability of looking up items for you. You can have a list of up to 99 items for each automatic filling choice. So, for example, if you were using VersaForm as an inventory program, you could design the forms so that when you entered a stock number, the program would automatically look up that item's description and price and fill it in on the form for you.

You can override this function, if you wish. For instance, if you've used VersaForm as outlined above, and it looked up the description and price of an item, you're allowed to change that description or price if you wish.

VersaForm can also do any calculations your form might require.

As you're working with your forms, VersaForm provides you with a help command. Basically, the program will then display the instructions for the procedure you're working with (the same instructions that are in the manual). This is a good idea, and one that saves a lot of time spent looking up things in the index.

The real strength of VersaForm shows up not only in its file-handling ability, but in the infinite variety of reports and analysis-type things you can do.

You can, obviously, print all the data in a certain file, but you're also able to design a report based on what you want. This is done in much the same way you designed the original form.

You have to instruct VersaForm on what items to print, where on the page you want them printed and which selection conditions have to be met to have VersaForm pull an item from the file. It can sort your items alphabetically, numerically low to high or vice-versa, by date of entry, etc.

One area of VersaForm that could stand a shade of improvement is the way it handles printing. They never suggest that you turn on the printer. Instead, you'll see a question like OUTPUT DIRECTLY TO PRINTER Y/N? If you answer Y and don't have the

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machine turned on and on-line, the system will hang.

No big deal—you just hit Reset and it will start over, but a little extra help would have been nice. The system, by the way, is Reset protected in the sense that if you do hit the Reset button, the program starts over by itself.

When you are doing a report, you're not limited in the number of items you can have; often, a program will pull too much data into memory and simply run out of storage space. VersaForm gets around this problem by using a Report Work Disk; as the data is collected from your data file (to generate a report), it's saved on the Report Work Disk. Your printout, designed according to your specifications, is then printed from this disk. It's a good way of handling things, and virtually lets you work with as many report items as there are items stored on a file disk.

Perhaps the best feature of VersaForm is its lack of limitations. If you buy a mailing list program, for example, you're hemmed in by the program selections that are built into it. It's easy, but limiting.

VersaForm, on the other hand, does require a bit of thinking. Someone actually designs the forms, printouts and reports . . . but you're literally unlimited in what you can do with them. Also once a form is designed, anyone—your secretary, or whoever—can easily fill in the data, just like she'd been doing it on paper—only with much more speed and accuracy.

For the businessman who can't afford to buy a program for every application he has—or for the homeowner who can afford just a single program, VersaForm is ideal. Its use is limited only by your own imagination.

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Gregory R. Glau
Prescott, AZ

Apple Flasher

Convenient and rapid Display of high Resolution pictures

Perhaps it should be made clear at the outset that this is not one of those "for adults only" programs—you don't even need a raincoat to use it!

Apple Flasher is billed as a powerful and flexible graphics display tool which will find and display high resolution pictures stored on disk by other Apple II programs. Apple Flasher is written for the Apple II Plus or Apple II with Applesoft ROM and supports one or two disk drives (DOS 3.3).

Apple Flasher lets you display numerous high-resolution screen pictures with a minimum of fuss and little, if any, programming. The capabilities included provide some unique ways to handle binary high-resolution files.

There is no provision in the program for creating high-resolution screen display files. There are, however, several excellent programs on the market designed for just that purpose. Before attempting use of "Apple Flasher," you should have a disk or two (DOS 3.3) of picture files.

After the program disk is booted, you are asked to place a picture disk in Drive 1. At this point, you may remove the program disk and place a picture disk in Drive 1 or specify Drive 2. Pressing the escape key during any operation returns you to the menu; pressing escape when the menu is displayed terminates program operations.

Several modes of operation are provided: search diskettes for high resolution pictures, single picture display, scan display, projector mode and auto display.

Almost all the commands used are single keystrokes; the program does a good job of prompting the actions required.

To search a diskette for high resolution picture files, you need only type the num-

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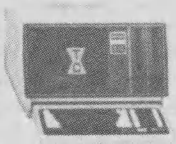

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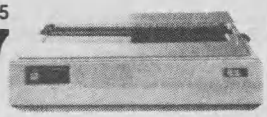

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ber of the drive in which the disk is located. When the files have been located, their names and a key letter for each are displayed. If no picture files are located on the disk in use, the program promises to inform you within two seconds.

Single picture display consists simply of pressing the key which corresponds to the key letter shown by the picture file name. Once a key is pressed, the picture is displayed in about two seconds.

Drives may be alternated by pressing the number of the drive prior to the letter for the picture file.

Once a picture is on the screen, pressing the spacebar will display the name, letter key and timing information for that particular picture file across the bottom of the screen. Pressing the spacebar again returns full-screen display mode.

The scan display mode (started by typing S) will automatically show, in sequence, all the pictures on the disk in the most recently used drive. Each picture is shown for about two seconds. Scan display can be temporarily halted and restarted by pressing any key but the spacebar.

Operation of the spacebar is the same as that described in the single-picture-display mode. Once all the picture files on a disk have been displayed, the scan function automatically starts all over again at the beginning. Pressing the escape key will stop the scan and return you to the program menu.

In operation, the auto display mode is very similar to the scan mode just described, with one very important difference—timing information may be embedded in each picture file. When using time codes, each picture file may be displayed anywhere from two seconds to four minutes. A short keyboard routine for inserting time codes into your picture files is included in the user's manual.

Files without timing information will be displayed for approximately 1.5 to two seconds in the auto display mode. To initiate auto display operations, type Z for one disk or CTRL-Z for automatic display of pictures contained on both disk drives. The show automatically repeats when completed and may be interrupted by pressing any key.

The projector mode faithfully imitates the action of a circular-tray type slide projector, right down to the remote control (game paddle). Typing CTRL-P will display the first picture on the disk in the current drive. From there you are free to use either the game paddles or the left-right arrow keys on the Apple II's keyboard.

To move forward through the pictures, turn the game controller clockwise and press the button to display the next picture. Turning the control counterclockwise and pressing the button returns you to the previous picture. From the keyboard, the right arrow key advances and the left arrow key returns you to the previous picture.

Here's the kicker—the disk is always loading one picture ahead. Changing from one picture to the next or back to the previous one is instantaneous: press the button (or key) and there it is! An audible signal is used to indicate the last picture on a disk. At this point you may insert a new disk or type the number of the other drive to continue. Pressing the escape key returns you to the program menu.

Apple Flasher does exactly what the manual says it will. It provides a convenient and rapid way to display high resolution pictures previously stored on diskettes. The simplicity of the various display options reflects a great deal of planning on the part of the program writer, Paul W. Mosher.

Who can use a program like Apple Flasher? Almost anyone involved with Apple II graphics for either a stationary display or visual-aid portions of a presentation. I particularly like the projector mode, since pictures can be flashed on the screen with a minimum of attention to the computer itself.

If you can use a slide projector, you can use Apple Flasher. It's just that simple! With a little imagination, almost any Apple II owner who would like to show off the graphics-display capabilities of his machine can look like a real pro.

The documentation accompanying this program is clear and concise. The error trapping and clearly outlined prompts built into the program will prevent you from going too far astray. Crow Ridge offers back-up copies of the program, replacement of damaged disks and updates to registered owners of Apple Flasher.

Any problems? I couldn't find any operational problems. However, there are a few capabilities I would like to see included. The auto display mode reads each disk in sequence from the first picture to the last. It would be nice to specify an alternative sequence for the pictures to be displayed in without having to revamp the order of the binary files.

It would also be valuable, under some circumstances, to be able to control the display from some other user-generated program. This capability would be especially well suited for display situations where a program is demonstrated and then further explained by a sequence of high resolution pictures.

Not every Apple II owner will have either the need or occasion to use Apple Flasher. For those of us who will, however, this program has a lot going for it. The combination of a program that does exactly what it is intended to, offers clear documentation and a bargain price makes Apple Flasher a wise selection.

(Apple Flasher is published by Crow Ridge Associates, Inc., PO Box 1, New Scotland, NY 12127, and sells for $34.50)

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Basic' (meaning basic prime) is a program development system which forces structured programming and uses no line numbers. It allows no Gosub statements, but adds a number of statements not found in standard Applesoft. Yet a program compiled by Basic' looks like any other Applesoft program—complete with line numbers and GOSUBs, and without any statements not normally found in Applesoft.

There are several advantages to programming with Basic' instead of going directly to Applesoft. First, it's easier to write Do Search than it is to write GoSub 650, because you don't have to maintain a list of line numbers identifying subroutines.

Second, the indented, structured format of a Basic' listing is easier to read. This makes understanding another programmer's efforts much easier. It also makes debugging and modification easier.

Finally, the addition of several statements not found in Applesoft makes short work of what used to be tedious routines. The tedious routines appear in the compiled program, but Basic' wrote them, not you.

The system is making a better programmer of me, because its structured format helps me keep track of what I am doing, and its more powerful commands allow me to do easily what had been difficult. Comparing a Basic' listing with its compiled Applesoft counterpart results in a learning experience that's bound to improve programming techniques.

Control Statements a la Basic'

For . . . Until. This works just like For . . . Next does in Applesoft, except it is more powerful, and you don't use the Next. Everything inside the loop is indented, and ending the indention implies a Next. The Until statement is a powerful option within the loop, allowing the program to break out of the loop before the count is completed if the Until statement is satisfied. Loops are nestable as in Applesoft, but are more easily seen in a Basic' listing because of the indention.

Repeat . . . Until. This new statement builds a loop that requires no counter. With it you could repeat a program operation indefinitely, or until something happened to satisfy the optional Until statement.

PROC (name). This statement replaces the Applesoft subroutine. Lines under the procedure name are indented automatically. The subroutine ends when you force an unindented line.

Do (procedure name). This statement replaces the GoSub command, and is much easier to use because you don't have to state the line number of the subroutine.

If . . . Else. This works like the Applesoft If . . . Then, except the Then is unnecessary becaue of the indented formatting. The Else option is valuable and allows some alternate action when the condition tested by the If is false.

Case (expression) . . . Else. This new statement works something like If . . . Then, in that it tests for a condition and selects an action accordingly. The Case statement contains a string or numeric expression; subordinate lines must reflect the nature of that expression. Subordinate lines are mutually exclusive, so the first line that satisfies Case ends the routine. The Else option may be added to perform an action when no other line satisfies Case.

ONERR. This statement commands a subroutine which is executed when an error condition occurs. The only difference I could find between this and an Applesoft ONERR statement is that Applesoft ONERR requires a GoTo statement; in Basic' ONERR simply commands an action in statements indented beneath it.

EQU. Normally, the program is compiled into Applesoft with sequential line numbers within each routine, with the first routine at line 200, the second at 400, etc. EQU allows you to specify the line number at which a particular routine will start.

Program. This statement is used to chain several programs together. If you are writing a program that is too large to fit in the Basic' buffer, you write segments of it and save them individually. The Program statement compiles them one by one and saves them as one large Applesoft program.

The Basic' buffer holds 420 lines of code, with a maximum of 240 characters per line, so it would take a pretty large program to require this. Since these miniprograms still exist on disk in their uncompiled form, you can use them again in another program.

The Edit' module, from which you type in the program, has a good text editor that allows quick and easy modifications. Editing commands within this module include cut text (for removing blocks of lines), insert, delete, move cursor right/left, tab right/left, page forward/backward, forward/backward one line, find, replace and move.

In addition to this module you can (P)rintout (if you had turned on the printer before entering the module), (L)oad an existing text file and (S)ave. Incidentally, the program remembers, from one session to another, the name of the last file you worked on, and defaults to that file with the load command. You can select a different file by typing over the filename prompt. The same is true with Save.

Installation Problems

Basic' does make programming easier, allowing you to easily do a lot of things that are difficult in Applesoft. But this version has a number of problems that make it difficult to install and to use.

This is my first experience with copy

(continued on page 186)

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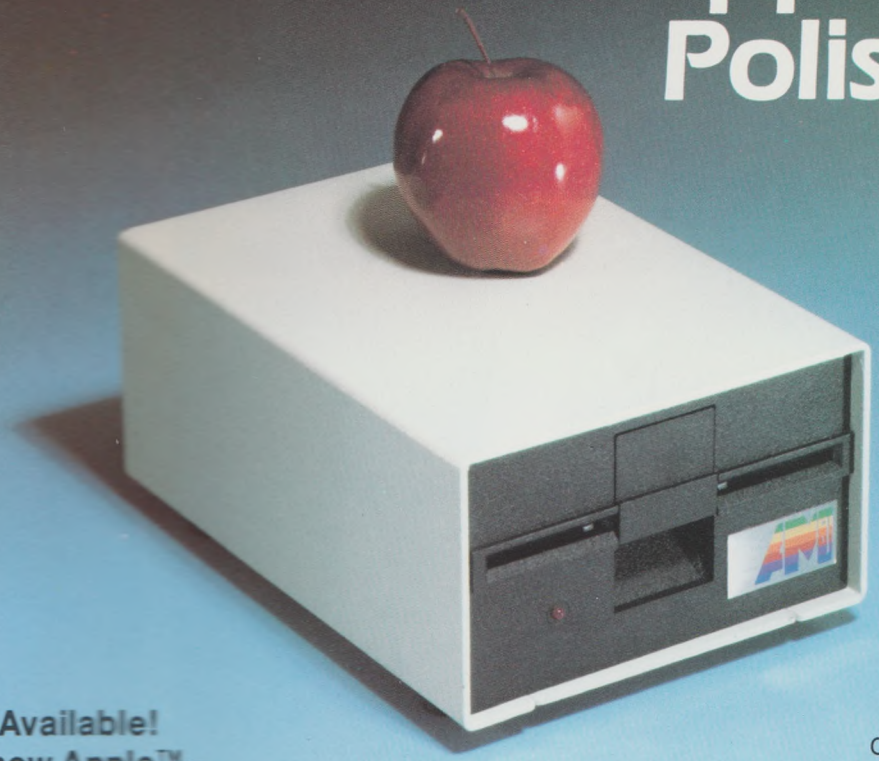

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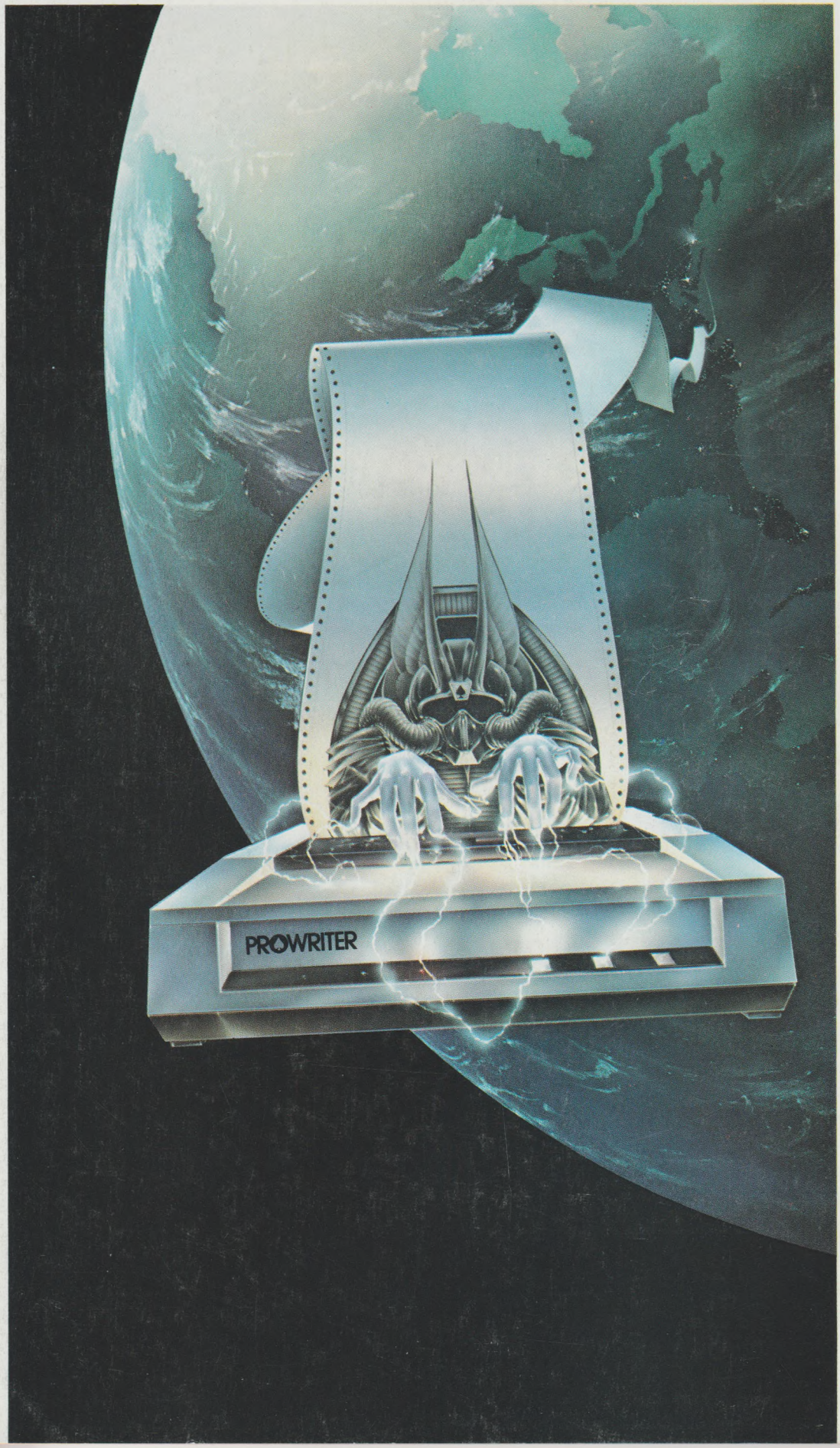

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